FEB 26 1921

PUBLIC WORKS

CITY COUNTY STATE

THE DOWNSTREAM SLOPE OF THE GERMANTOWN DAM, MIAMI CONSERVANCY DISTRICT

The view shows especially the flat sand and gravel slopes of the dam embankment, these growing flatter at each berm to give the dam a broad base and ample stability. The upstream slope is similar. Construction of this dam will be described in the next issue.

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Drainage in Port Arthur

Milwaukee Water Works

FEBRUARY 19, 1921

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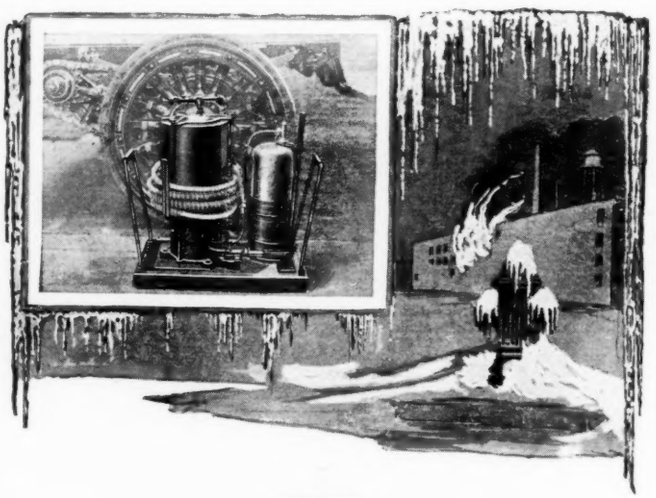

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Some Observations and Facts Concerning Motor Sweepers

By John T. Child*

Some facts, figures and suggestions for operation presented by an engineer of the Rochester Bureau of Municipal Research. Details of construction and operation of the different makes. When the use of such sweepers is financially advisable.

Motor street sweepers have unquestionably proven themselves and have come to stay. There are only two companies making this kind of equipment. The Elgin Street Sweeper Company first demonstrated motor sweeping in 1913 and its machines were put into general use during the war. We are told that the first machine built by the Austin Company was sent to France to do special work. Since then both machines have been greatly improved and their sale and use has increased rapidly. This kind of sweeping equipment has solved a difficult labor problem at reduced costs and undoubtedly has a very bright future before it in the street cleaning field.

Motor sweepers perform three operations simultaneously—they sprinkle, sweep and pick up the street dirt. In the past these operations required a team and driver with a sprinkling cart, about 12 sweepers with push brooms or scrapers and a pick-up wagon with a team, driver and two men. Motor sweepers do not sweep up the very fine dust and hence cannot take the place of motor flushers. However, they can be worked to great advantage by following over a smooth flushed street several hours later. In such cases it is necessary to sweep the gutters only and in this way they can pick up the dirt washed toward the curb by the flushing operation and cover a greater number of streets. When this is done, the area sweep should be figured from the miles swept and not from the total width of street.

Successful and economical motor sweeping depends on several factors which must be taken into consideration if good results are to be obtained. The original outlay for equipment is rather high and the motor sweepers have a good many moving parts requiring frequent and careful attention. If good mileage is to be obtained the sweepers must be run over regular routes and be kept going. In this regard routes should be laid out with as few reverse turns as possible as it takes nearly as long to turn around at a dead-end street as it does to sweep a full block.

Naturally motor sweepers do their best work on pavements in good condition, especially brick and asphalt, but they do excellent work also on block pavements and in car-track areas. Rough pavements are always harder to clean than smooth ones and hence are sure to cost more. If pavements are rough, going over them with heavy motor equipment shakes up the apparatus a good deal, wears the brooms rapidly and progress must necessarily be slower than on good pavements. Hence the costs will be higher.

Unit costs should be based upon miles traveled rather than on miles swept because so much depends upon the way the route is laid out. However, it should sweep as it goes if routes are laid out to the best advantage because if a machine has to go two miles before it starts sweeping and returns two miles running idle, nearly an hour's sweeping time is lost, which reduces its possible daily sweeping area 15,000 yards or more. No attempt will be made herein to give accurate cost data because figures received from about 20 cities are in no way comparable because there is no uniform practice of cost keeping and the whole truth is not known even by the person who compiles them as best he can. The range including overhead is from 12 to 30 cents per 1,000 yards, which is cheaper than hand work.

There are two makes of machines on the mar-

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ket. The Austin sweeper and the Elgin, both of which have a gutter broom attachment which sweeps the heavy dirt from the curb out under the main broom, which in turn sweeps all the dirt on to a conveyor that raises it up to the top of a hopper. The Elgin Company also makes a separate motor sweeper without any conveying or hopper equipment. This machine has its broom at an angle similar to a horse-drawn broom, which sweeps the dirt into a windrow on the left side, from where it can be picked up by a separate pick-up sweeper. Of course the first cost of this machine and the operating expense are both less than for the larger pick-up unit. While it does not sweep as wide a swathe the unit cost per 1,000 yards is appreciably less. This machine must, of course, be used in co-operation with the pick-up sweeper or else the material must be piled and loaded by hand, which is not an economical plan.

Operator—The operators for these sweepers should be good motor truck drivers and also men who will take interest in what they are doing. There are a good many things to look out for and the cleaning value of the work depends very largely on the operator. It is necessary that he keep as close to the gutter as possible and on this depends the real success of the equipment because most of the dirt is to be found in the gutter.

The wages paid in 1919 and 1920 for drivers of this kind of equipment ranged from $3.50 to $6 a day, depending on the city, almost all of them being paid $5 a day. It is possible for one man to operate either Elgin or Austin sweeping machines. However, for the Austin machines, some cities use a helper and others pay the driver a little higher salary if he will do the work without a helper. Some of them pay the driver a bonus for not having much lost time due to breakdowns. In other words, they make it worth while for the driver to take care of his machine and keep it in good running order. This is most important if good consistent results are to be obtained.

Helper.—If a helper is used on the Austin machine he should be a good lively laborer who can jump off the machine, run ahead and pick up stones, boards or other obstructions which will prevent the machine from doing a complete job or which might cause clogging in the conveyor. On smooth pavements the helper should sit on the right side where he can jump off easily and also raise and lower the gutter broom. On rough pavements the helper should sit on the left side where he can work the rear broom lever, which should be used to get the dirt out of holes and depressions. (This is done by merely pressing forward on the broom lever when a particularly bad place in the street is reached. On the Austin with a left-hand drive it is possible for an expert driver to do this with his foot, but it is good deal to ask of a new man, when he has so many things to think about.) The helper also should release the dumping device and pull over the dirt in the hopper when necessary. He can save time by raising the hopper doors while the driver is backing off the load. A helper can also save time when filling the water tank. $3.40 a day should cover the expense of an extra man.

Hopper.—The hoppers on the machines will hold from two to three cubic yards when level full below the conveyor spout. In practice, however, it is found that the right-hand side of the hopper fills up quicker than the left-hand side because the dirt is much heavier in the gutter. If there is a helper on the machine he can pull the dirt over onto the left side while the machine is in motion, or else the machine may be dumped when the right side becomes full. This may reduce the capacity of the hopper 10 per cent or so. The capacity of the hopper is seldom as important as is finding a desirable place to dump. In other words, if a good dumping place is found before the hopper is full, it is well to dump the load then and there to facilitate removal and to avoid danger from the piles on the street. Sometimes the machine will pass a pick-up wagon and when that occurs it is well to dump the material so it can be picked up immediately.

It was found in timing a number of loads from an Austin machine that it took on an average of four minutes and two seconds to dump a load. The hopper bottoms are worked in exactly the same manner as a bottom dump wagon, and the load is dumped in two separate piles touching at the base. Ordinarily for a full hopper the right-hand pile will not exceed nine feet in length. After the hopper became limbered up it was found to work very satisfactorily and to leave a neat pile on the street. Fairly level ground is necessary for dumping purposes as the clearance is small. The Elgin hopper dumps by letting half the V-shaped bottom swing free. The pile left is only three or four feet long and as wide as the hopper is long. This dumping device is simple and effective.

Sprinkling Devices.—The Austin machine has a 150-gallon water tank and the sprinkling device, containing nine nozzles, is on the bumper. The pressure is regulated from a pump which operates satisfactorily at 50 pounds but which can be increased to 65 pounds if necessary. The tanks can be filled in four minutes, twenty-six seconds, this being the average of twelve loads timed. This period covers the time between the stopping and resuming of sweeping operations. It is usually advisable to fill the tank when the load is dumped even though it may not be entirely empty. If the load is dumped anywhere near a hydrant, the double operation can be completed in less than eight minutes. In the sprinkler system there are water strainers which collect a great deal of the sediment which may come from the hydrants. However, it is desirable to carry a small wire for cleaning out the small holes in the sprinkling nozzles.

The Elgins have 180-gallon tanks tested for 100 pounds pressure. From this tank an atomized spray is delivered from four nozzles from the front of the machine with a pressure maintained and regulated by a compressor driven from the transmission.

The sprinkling devices when once cleaned out work satisfactorily except when the dirt is very heavy, in which case it was found that the dirt on the street absorbed all of the water by the time the machine had run over it. In very heavy dirt there is dust thrown up around the machine which is undesirable and disagreeable. It is believed, however, that if the machines were run over regular routes three times a week this condition would not result. Here again is an example of how the best results can be obtained by properly planning and routing the work of the machines.

Gutter Broom.—The gutter broom first used on the Austin sweeper is made of 24 pounds of split bamboo, each of the 24 U-shaped bundles being bolted on separately. This material proved to be satisfactory except where the dirt is in piles or very heavy or wet. In 1920 it cost from seven and one-half to ten cents a pound before wired into bundles. If it is very wet and muddy all of the material is not swept out the first time over. If the material is in piles some of it is thrown up on the curb and left behind and some of it is thrown out beyond the machine, where it may be taken up on a center trip. A newer design consists of four discs for the gutter brooms which are easier to take apart and refill than the original design. They increase the sweeping width three inches. The company has also designed a different kind of holder so that wire may be used for filling these brooms in place of bamboo. The stock should be made of a 60 to 80 per cent carbon steel. This will have a good deal of spring to it and has been proven more satisfactory and lasting than the bamboo. The bamboo gutter brooms may be used satisfactorily until they are worn down to within four inches of the holder. Gutter brooms of split bamboo were used up after sweeping from 10.2 to 14.7 hours of gutter sweeping or from 41 to 63 miles, depending on the kinds and conditions of pavement and dirt encountered. These brooms can easily be replaced in the field if necessary.

The gutter broom on the Elgin machine is of somewhat different design. The only stock used is wire and the broom is attached by a universal joint which helps the device to conform to the angle of the crown of the pavement so as to meet all conditions.

Rear Broom.—The rear brooms are bamboo filled and are found to work satisfactorily and to wear down evenly so that it is not necessary to reverse their position, as must be done with horse-drawn equipment. The broom may be worn down to within three inches of the guard before being discarded. On rough pavements it is necessary to have the longer bristles (that is a newer broom) in order to get all the dirt. A broom fairly well worn down does excellent work on smooth pavements. It was found necessary for good results to replace the rear broom after from 17 hours to 23 hours of service, during which time it had swept a lineal length of from 61 to 94 miles. The Elgin brooms require 85 pounds of 24-inch fiber while the Austin Company believes in using nearly twice as much. A cable is preferable to rope for winding the brooms.

Conveyor.—The conveyor of the Austin machine will not pick up stones larger than two inches under ordinary circumstances, without risk of shearing off the wooden pins which are placed to prevent any serious damage being done in case the conveyor becomes clogged. The conveyor consists of rubber squeegees operated by chains and is very effective in carrying dirt to the hopper. If there are pools of water in the gutter a surprising amount of mud and water will be carried up into the hopper and remain there. It is claimed that the squeegees will last about three months. At the end of that time it may be necessary to replace them with three-inch strips of rubber or rubber fabric. The conveyor must be watched closely by the driver in order that no damage may come to it. It must be always raised up when the machine is backed up or else the apron which catches the dirt will be crumpled up.

The conveyor of the Elgin sweeper is just the reverse of the Austin. Instead of movable rubber squeegees, they have a movable rubber belt conveyor which actually carries the dirt to the hopper while the squeegees on the Austin push the material up an inclined plane. Both methods are effective.

General.—It has been found a little difficult for a new driver to sweep close to the gutters, but this simply requires practice. When properly operated the gutter brooms do very satisfactory work. The Austin machine can sweep in a circle with a radius of thirteen feet and three inches, while the Elgin, which has only three wheels, can sweep in a circle with a radius of nine feet. It has been found in practice that there is a tendency at corners to leave a segment at the curve unswept. When going around a standing vehicle there is a segment in the gutter for 30 to 50 feet which remains unswept as there is no follow-up sweeping done. This is a bad feature in a way, but it can be minimized and reduced by care and practice and if the machines are run over a regular route these things will not be serious, especially at night.

When a machine passes a private driveway, it is always sure to leave a row of dirt along the entrance to the driveway and there appears to be no way of preventing this. Also when the conveyor is picked up for turning around, some dirt is left on the pavement. If the machine comes back the same way it can pick that up again, but if it goes on there is a small row of dirt left on the pavement.

In all municipal work of this kind there is some difficulty in getting officials to plan their work properly and in having men trained to do things the best way, and to the best advantage.

Motor sweepers must not be considered as a panacea for all street cleaning ills because they will not do everything. However, it has been proven that motor sweepers can sweep consistently at a speed of six or seven miles an hour and do good work at the rate of four miles or more an hour, including turns and stops for dumping

and taking water. The desirable width of a motor sweeper depends on the width of a street, particularly on car track streets. They should be able to pass a trolley on the right. A machine which cannot do this causes considerable delay on such streets. The prevailing width of streets is important also because certain widths make a great deal of unnecessary lapping.

There is no doubt but that both machines are well made and designed, and it has been demonstrated that they will do all that may be reasonably required of them. There are about 250 in use in this country now. The designs are being constantly improved just as any other valuable piece of machinery is improved as time goes on.

WHEN FINANCIALLY ADVISABLE

Many small cities are unable to decide whether they have enough pavements to warrant the purchase of motor sweepers. A good way to arrive at this conclusion is by first figuring the miles of hard paved streets in at least fairly good condition. Then consider that a machine should sweep about 25 lineal miles a day and that probably three trips per street would be the average number of trips on the whole street length. These figures are more or less set and the only variable to be decided upon is the number of times a week the streets are to be cleaned. This should be from three to six. In small towns, which usually have a comparatively small percentage of hard paved streets, it is desirable, if not absolutely necessary, to sweep the streets six days a week because so much dirt and mud is being constantly washed in and tracked in from the many unpaved cross streets.

In a northern climate a sweeper would probably not be used over 200 days a year. This would mean a maximum mileage of 5,000 miles a year. If used to the maximum or near it, the life of heavy equipment of this kind would probably not be over five or six years—depending largely on the care received and replacements made. If the sweeper is kept going, the cost is bound to be less than by hand labor. The comparative costs should be figured somewhat as follows:

The range of motor sweeping figures from about 20 cities show a sweeping cost of from 12 cents to 30 cents per 1,000 yards. These costs include operators, mostly at $5 or $6 a day; six to eight gallons of gas a day; oil and grease at 35 to 48 cents a day; 1,500 to 2,000 gallons of water at 10 cents per 1,000 gallons; gutter and main broom wear from $4 to $8.50; repairs and painting at $3 to $6; supervision at $2 to $3; depreciation at 20 per cent of cost for a 200-day year and interest at 6 per cent. Complete insurance, if taken out, costs about 90 cents per day. Storage cost may be added if desired. The rather wide variation in these costs are due to a few important factors:

(a) The demand for really clean streets;
(b) The manner in which the routes are laid out;
(c) The care given the machine;
(d) The caution and skill used in operating; and
(e) The kind and condition of the pavements. These may affect the area swept daily by over 100 per cent because with the same machine the variations range from 100,000 to a capacity of 280,000 square yards.

The area to be cleaned should be at least in the neighborhood of 100,000 or more square yards. This would mean from seven to ten lineal miles of paved streets averaging 24 feet wide and requiring six cleanings a week. The type and cost of equipment and the mode of pick-up should also be given consideration. The capital outlay will, of course, affect the depreciation, interest and insurance charges. The gas and oil consumption will be dependent on the type of machines used. If gutter brooms are not used, the total broom cost will be reduced as will also the area that can be covered.

Now, what does patrol sweeping with hand brooms actually cost? One man at $4 cannot sweep on the average over 10,000 yards a day under the conditions mentioned.

One sweeper's equipment now costs as follows:

	First cost	Aver. life with repairs	Repairs	Replacements or depreciation	Total
24-in. fibre or 18-in. wire broom	$2.00	4 months	$0.25	$4.00	$4.25
1 No. 6 scoop shovel	1.90	2 years	.25	.95	1.20
6 barrels at $4.50....	27.00	6 years	5.00	4.50	9.50
1 barrel cart at.....	25.00	5 years	1.00	5.00	6.00
1 barn broom at.....	1.00	3 months		3.00	3.00
Total	$56.90		$6.50	$17.45	$23.95
1 man, 200 days at $4.00.....					$800.00
Tools					23.95
Total cost					$823.95

200 days times 10,000 yards equals 2,000,000 yards swept.
This area cost $823.95 or $.412 per 1,000 yards.
Add supervision, $.025 per 1,000 yards.
Total cost, $.437 per 1,000 yards.

It can readily be seen that this figure does not compare favorably with motor sweeping costs as it is over 33 per cent higher than the highest figures quoted for motor sweeping. In larger cities "litter patrol" work by hand is absolutely necessary to keep the business streets picked up, but in small towns the business streets are relatively short and can be cleaned by motor equipment when least crowded. Nothing has been mentioned about double shift work. There is no reason why motor sweepers cannot be used two shifts a day as flushers are—the more crowded thoroughfares being cleaned after midnight. This, will reduce capital outlay, interest and insurance, but not other items except the unit cost.

Illinois Federal Aid Roads

More than 700 miles of Federal Aid roads have been constructed in Illinois, including the Lincoln highway across the north end of the state, the Dixie highway paralleling the eastern border, the Old National Trails road across the southern part, and the St. Louis and Chicago road. The two first named are nearly completed while the other two are well advanced. On another Federal Aid road known as Route 10, from Springfield through Decatur to Danville, heavy grading contracts have already been let.

N. Y. Harbor Dry Dock Corporation's Plant*

Driving inclined piles, dredging and excavating by special methods around piers. Equipment used by contractor.

The sheet piles and the inclined piles were driven by a McKiernan-Terry steam hammer operated in swinging leads that, for some of the piles in the piers, were suspended from the tower of the regular floating pile driver. For the sheet piles and the remainder of the spur piles the swinging leads were suspended from the mast or boom of a derrick boat, working on the outer face of the bulkhead line, because in some cases the depth of water was not sufficient for the draft of the regular floating pile driver.

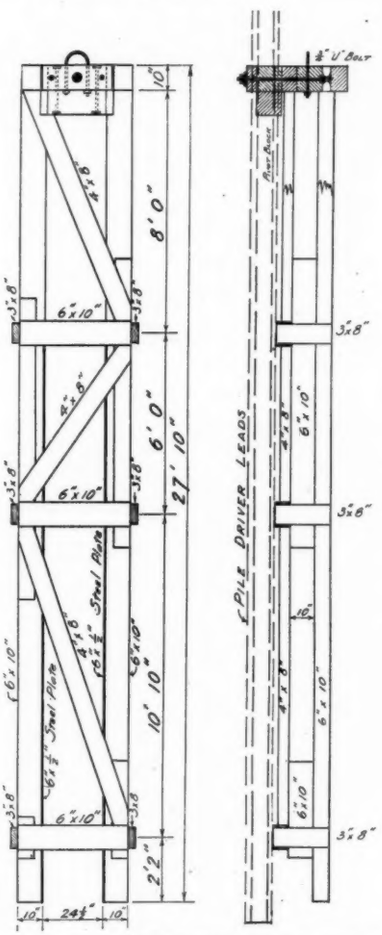
The swinging leads, about 28 feet long, had two 6 x 10-inch guide timbers faced with 6 x ½-inch plates and spaced out clear of the face of the fixed vertical pile driver leads, which engaged a sliding pivot block from which the swinging leads

(*Continued from Page 143)

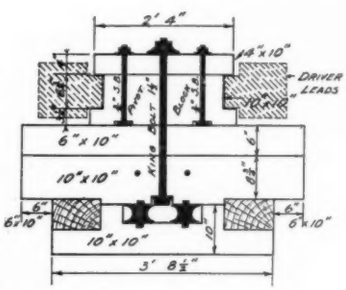
DRIVING SPUR PILES WITH STEAM HAMMER IN SWINGING LEADS

were suspended, and which was itself raised and lowered by a tackle suspended from the top of the fixed leads, or from the derrick boom. The swinging leads were easily attached and detached and were very flexible in operation, permitting the piles to be driven at any angle, and were considered efficient and satisfactory. The pile driver gangs were followed by successive gangs that did the stay lathing, cutting off, capping, placing the stringers and laying the decks, respectively.

Concrete for the bulkhead walls was mixed in a Ransome machine mounted on a small scow that was towed from Stapleton about 1 mile away, bringing on it quantities of broken stone, sand and cement sufficient for two days' run. The scow was moored alongside the forms and the mixer was elevated far enough above its deck to discharge through a chute directly into the forms.



SWINGING LEADS FOR DRIVING BATTER PILES



Section through Head.

To Connect Up: Lower Hammer to bottom of Driver Leads. Turn Pivot Block and remove ¾" Screw Bolts.
Hoist Swinging Leads into position inserting Pivot Block in Driver Leads. Cant Swinging Leads far enough to permit replacing ¾" S.B. through 4"x10" and Pivot Block.
Pass Hammer Cable through Sheaves in head of Swinging Leads and hoist Hammer through bottom into position.

DREDGING

The original depth of the water between the piers varied from nothing to 22 feet below mean low tide, and dredging to the required depths of from 22 feet to 33 feet for the wet basins and 44 feet for the dry dock basin, involved the excavation of about 200,000 yards of sand, clay, some hard-pan and occasional boulders. At the commencement of operations a 5-yard clam-shell dredge was used but proved unsuitable for the very hard bottom. Nearly all of the dredging was done by five dipper dredges with dippers varying from 5 yards to 15 yards capacity. The dredged material was delivered to mud scows, towed about 5 miles out to sea, and dumped in deep water. The best dredging record was made by Dreymann Brothers' dredge, Toledo, having a 15-yard bucket and a crew of 18 men. In March, 1920, this machine excavated 40,600 yards of material.

SPECIAL METHOD OF EXCAVATING AROUND PIER PILES

The dry dock pontoons are rectangular in section with flat bottoms, making it absolutely necessary for the dredging to be carried down to grade close to the piers. The result of building the piers before the dredging was finished was that there were places which the dredge could not reach where the ground elevation had to be lowered considerably. The difficulty was overcome by having the dredge dig to 4 or 5 feet below grade as close to the piers as possible, so that the material beyond its reach would slide down into the hole it had made and thus make grade on the required line.

At the angle at the inner end of Pier A (marked X on the plan) it was not possible for the dredge to get close enough to the corner for this method to work, and recourse was had to jetting. For this purpose a 2-inch water line fitted with a ½-inch nozzle and water at about 90 pounds pressure was used. A ¾-inch air line was carried down outside the pipe to about 6 inches from the nozzle. The air line was plugged and a number of small holes drilled in it close to its lower end. The air, which was under a pressure of about 100 pounds, agitated the water so that the tidal currents carried away the material loosened by the jet. By this means the ground elevation in this corner was lowered about 10 feet, and the excavation brought down to grade. A large boulder found in the same corner was disposed of by jetting alongside and causing it to sink into the hole thus formed.

YARD AND SHOPS

The area between the bulkhead wall and the street was filled chiefly with cinders brought in by scow, unloaded over the bulkhead wall by derrick and clam-shell bucket, and distributed by drag-line scraper. The original intention was to make this fill with the material dredged from the basins, but it was found to be unsuitable for handling with an ordinary bucket, so the scheme was abandoned and the fill made as described above. About 40,000 cubic yards of fill was required.

The principal buildings in the filled-in area have pile foundations and the others have spread footings. All have steel frames with brick or corrugated iron walls, and roofs of wood, corrugated iron or reinforced concrete. The carpenter shop is a two-story building, the others are one story.

The machine shop is provided with all the usual machine tools, including lathes, planers, milling and boring machines, and a 20-ton traveling crane. There is a 32-foot lathe on which can be turned the propeller shaft for the largest ship, and it is also equipped with a portable electric welding machine which can be wheeled around to wherever there is work to be done, even on board the ships.

The blacksmith and pipe shop with its extension affords ample room for a large number of forges. The machines installed there include a power hammer, a reverberatory tilting furnace, two pipe machines, bending slabs, brazing hearth and electric spot welder.

The plate and angle shop, which is the largest shop in the plant, is provided with punches, shears, bending slabs, a small bending roll for plates up to 10 feet wide, a mandrel roll and a large roll for plates up to 32 feet in length. There are also two oil-burning heating furnaces, a plate furnace which will take a 35-foot plate and an angle furnace which will take a 50-inch shape. Jib cranes are used for handling the material.

The carpenter shop is provided with a planer, matcher, band saws, rip saws, plane table and wood working lathes. A well-equipped pattern shop is included in the building. The second story is used for a mould loft and for bench work.

GENERAL EQUIPMENT

At the head of each dock there is a 10-ton electrically operated derrick. There is also a 20-ton floating derrick with a long reach for handling heavy machinery on and off the ships.

The shops are supplied with electric light. A high intensity of illumination is given, care being used to prevent glare. The dry docks are equipped with flood lights, which supply the general illumination. Plugs are provided for lights where required on the under parts of the ships.

Electricity is supplied by the local power company at 6,600 volts, 3 phase, 60 cycles, and is stepped down in a centrally located transformer station to voltages suitable for lamps and motors. From this station it is distributed on overhead lines to the various shops, all of which are operated by electric power.

The dry dock pumps and flooding valves are also electrically operated. One man sits at the window of a small brick building on the shore at the end of the dry docks, and by means of a series of push buttons on a small bench board, starts and stops the pump motors and valves in accordance with signals from the dockmaster outside, thus causing the docks to be raised or lowered. Indicators on the board show the position of the flooding valves at all times.

CONTRACTORS' CONSTRUCTION EQUIPMENT

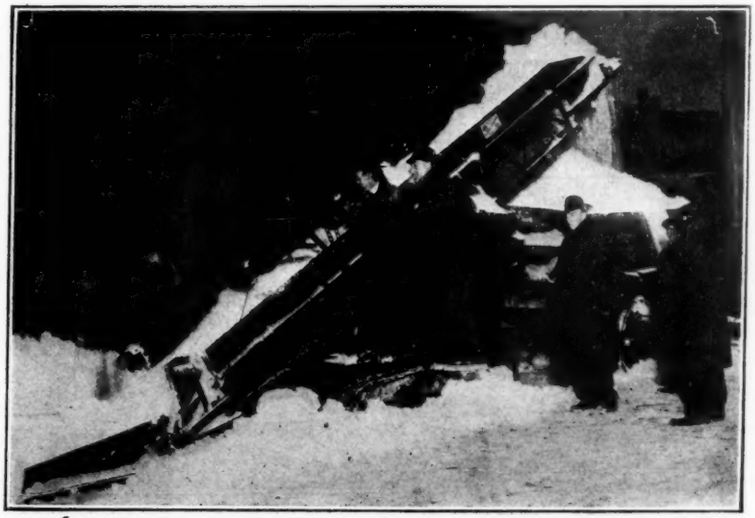
The following plant was used on the job: Two floating pile drivers, one derrick scow equipped

with a 60-foot boom stiff-leg derrick with Lambert boiler and engine; one Vulcan steam hammer; one small scow, used for handling concrete material; one ¾-yard Rex mixer, electric drive; one ½-yard Rex mixer, gasoline drive; one 1-yard Ransome electric drive mixer; one stiff-leg derrick for handling fill with 60-foot boom and 25 h. p. 3-drum Lidgerwood hoist engine; two vertical boilers, 25 h. p.; one horizontal boiler, 40 h. p.; one 400-foot Ingersoll-Rand compressor. About 300 men were employed. About 1,500 cubic yards of concrete was placed, and one million feet of lumber was used.

Mechanical Snow Loading in Chicago

Modified type of wagon loader with crawler traction loads snow 32 hours continuously from pavement to 8-yard trucks, filling them in 2 minutes each

The initial test of the new snow loader manufactured by the Barber-Greene Company, Aurora, Ill., was made on December 26, 1920, under the direction of Thomas H. Byrne, Superintendent of Streets, Chicago, who writes concerning it that "the loader loaded snow at the rate of better than 3 cubic yards per minute, although no provision had been made in the plowing and piling of snow for this machine. Trucks carrying 8 cubic yards were spotted and loaded out in less than 5 minutes. During the period of operations, temperatures ranged from 32 degrees above zero to 5 degrees below zero, but no change was noted in the efficiency of the loader, which apparently handled snow ranging from slush to almost frozen and was operated with equal success on bitulithic, wood block, granite block and cobble stone pavements.



LOADING SNOW AT THE RATE OF ABOUT 3 YARDS PER MINUTE AT NIGHT

SNOW LOADER MACHINE WITH CAPACITY TO LOAD 8-YARD TRUCK IN LESS THAN 3 MINUTES

"Hereafter on streets where the loader is used the snow will be plowed in a windrow along the curb, as the machine will load to a width of 6 feet from a continuous windrow equally as well as from isolated piles.

"With the present loader we are expecting a labor saving of better than $450 per 8-hour shift on shoveling from piles into trucks.

"Where we have always had difficulty in organizing crews for night work, we are now able, by the use of the snow loader, to remove snow at night, which time is most advantageous to us on account of the congestion of traffic during the day.

"Our past experience has been that approximately six men would load an 8-yard truck in 20 minutes, whereas the snow loader will load the same 8-yard truck in 2½ minutes."

The machine has a general resemblance to the wagon loader type and is provided with an adjustable 2-arm apron plow which scoops up and turns the snow onto a wide inclined endless belt, positively driven by roller chains on each side, that elevates the snow and dicharges it at the rear into motor trucks. Side boards 12 inches deep retain the largest lumps on the belt and increase its effiective carrying width to 36 inches.

The plow can be adjusted, from the operator's seat, to scrape the street surface clean, or elevated to clear any obstruction. The machine crew consists of 1 operator, 1 helper, and 2 laborers whose time is chiefly required at the plow. While the truck is being spotted under the discharge end of the machine the loader advances, drawing from 3 to 6 cubic yards of snow in the plow and on the belt, and discharging it all onto the truck in approximately

2 minutes. This rapid operation made it possible to reduce the twelve trucks previously required for the same work in Chicago to only four trucks, each of which was loaded in an average of 5 minutes.

The machine is mounted on a pair of 58 x 8-inch crawler tractions and has an elevating belt 22 feet long on centers. It is driven by a 4-cylinder Buda truck type gasoline engine with ample reserve for any operating conditions. It travels forward at 40 feet per minute and reverse at 107 per minute. It is 25½ feet long over all, 6 feet wide, weighs 10,000 pounds and discharges 11 feet 10 inches above street level.

The Illinois Experimental Highway

By Prof. Charles Carroll Brown*

Description of the sixty-four sections into which the two miles are divided. Each section differs in some respect from all the others. Concrete, brick and bituminous concrete wearing surfaces are included in nearly equal lengths.

In the previous installment of this article (see PUBLIC WORKS for February 5) a general description was given of the experimental road being built by the Illinois State Highway Department and an explanation of the principles and ideas to be employed in constructing it and making the proposed tests. In this article will be given a more detailed description of the construction of the several sections of the road

The road is divided into 64 sections, 4,000 feet containing 25 sections of concrete pavement, 3400 feet containing 22 sections of pavement with brick wearing surface, and 3400 feet of asphaltic concrete wearing surface. Of each of the two latter, a part is being laid upon macadam base and a part upon cement concrete base. The materials, thickness and other features of the pavement are varied so that no two sections are alike in all particulars. The accompanying table shows the principal features of construction of each of the sections.

CONCRETE PAVEMENT

Eleven of the 25 sections of concrete pavement have the apparent purpose of comparing the results of construction according to the present specifications, in sections continuous for each day's work, with results using transverse dividing planes spaced 25 feet apart, constructed with horizontal corrugations in a metal dividing surface, forming an interlocking joint which is expected to prevent vertical motion of slabs along the joints between them.

As will be seen from the table, crushed limestone is used in most sections, with gravel in a few others. The mixtures are made 1:2:3½ in all but 3 sections where they are made 1:2½:4½.

The thickness varies from 9 inches to 4 inches.

Reinforcement of four different types is being used in 10 sections.

In 4 sections calcium chloride or cemite cement have been added. Four per cent of calcium chloride was used in the first 125 feet of section 56, but under the conditions the concrete set so rapidly that it would not be finished properly except by rapid working and the percentage was reduced to 2½ per cent. Cemite cement is a mixture with Portland cement of a chemical having effects similar to those of calcium chloride, the mixture being made by the manufacturers and supplied ready for use. In this case the cement already owned by the state was sent to the mixing plant where the chemical was added and the cement was returned ready for use.

Dividing Planes. Sections 41, 43, and 45-50 have transverse dividing planes which are described as "formed by setting on edge strips of horizontally corrugated galvanized iron, the strips 6 feet long and width one inch less than the thickness of the pavement. The width of the corrugations was 3 inches, the depth one inch, 16 gauge metal, weight of galvanizing 2 ounces per square foot." The metal is set in the concrete with its top edge one inch below the surface of the concrete. In addition to the transverse dividing planes, all but two of the sections have longitudinal dividing planes down the center of the slabs.

Reinforcement. As stated, four methods of reinforcement have been employed, indicated in the table by the letters *A, B* and *C*. *A* consists of reinforcing with "circumferential" reinforcing rods, these being ¾ inches round deformed bars placed two inches from the top of the slab and 6 inches in from the edges of the subsections of the slab, with

TEST HIGHWAY, LOOKING WEST FROM THE ROAD THAT CROSSES NEAR TO MID-LENGTH. GRADING NOT YET BEGUN.

*Professor of Municipal, Sanitary and Highway Engineering and Dean of the College of Applied Sciences, Valparaiso University.

a 3-inch lap at intersections. There were thus four rods in each 25 by 9-foot sub-section of the slab, there being eight such sub-sections in the 100-foot length of section 45 and the same number in section 48. *B* refers to reinforcement with circumferential rods in each 25-foot length of the slab, the transverse rods running the full width of the pavement, so that this reinforcement is in 25 by 18-foot sections. The transverse rods pass through the longitudinal dividing planes, holes having been punched in the corrugated metal one inch below its upper edge or two inches below the surface of the slab, to pass the bars through. There were no longitudinal rods along the central longitudinal planes of di-

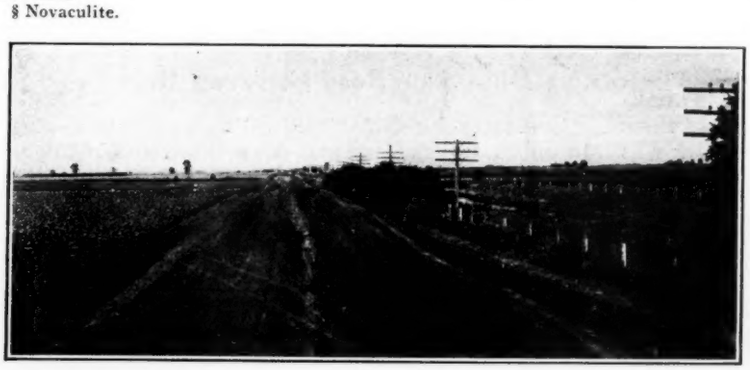
BRICK WEARING SURFACE

Section No.	Length of each section, feet	MACADAM BASE Depth of base, inches	MACADAM BASE No. of courses	CEMENT CONCRETE BASE Mixture	CEMENT CONCRETE BASE Thickness	CEMENT CONCRETE BASE Curbs	Thickness of wearing surface	Cushion	Condition January 1, 1921
1	200	4	1	....	....	None	3	Sand	Sub-grade only completed
2	100	4	1	....	....	None	3	Sand	" " " "
3	100	4	1	....	....	None	3	Mastic	" " " "
4	100	8	2	....	....	None	3	Sand	" " " "
5	100	8	2	....	....	None	3	Mastic	" " " "
23	200	....	....	1:2:3½	6½	6	3	1 in. sand	Base completed
24	100	....	....	1:2:3½	5½	6	3	1 in. sand	" "
25	100	....	....	1:2:3½	5½	6	3	1 in. sand	" "
26	100	....	....	1:2:3½	4	6	4	Mastic	" "
27	100	....	....	1:2:3½	4½	6	3	1 in. sand	" "
28	200	....	....	1:2:3½	4½	6	3	1 in. sand	" "
29	200	....	....	1:3:5	4½	6	3	1 in. sand	" "
30	100	....	....	1:3:5	3½	6	3	1 in. sand	" "
31	100	....	....	1:3:5	3½	6	3	Sand-cement	Base completed, top laid
32	200	....	....	1:3:5	3½	6	3	1 in. sand	Base completed, top laid
33	200	....	....	1:2:3½	2	None	3	.....	Completed
34	200	....	....	1:2:3½	2	None	3	¾ in. sand-cement	"
35	200	....	....	1:2:3½	2	None	4	.....	"
36	200	....	....	1:3:5	3	None	3	.....	"
37	200	....	....	1:2:3½	3	None	3	.....	"
38	200	....	....	1:2:3½	3	None	4	.....	"
39	200	....	....	1:3:5	4	None	4	.....	"

ASPHALT CONCRETE WEARING SURFACE

Section No.	Length of each section, feet	MACADAM BASE Depth of base, inches	MACADAM BASE No. of courses	CEMENT CONCRETE BASE Mixture	CEMENT CONCRETE BASE Thickness	CEMENT CONCRETE BASE Curb	Thickness of wearing course	Condition January 1, 1921
6	200	10	2	....	....	..	2 in.	Base not quite finished
7	200	8	2	....	....	..	2 in.	" " " "
8	200	5	1	....	....	..	1½ in. 1½ in. binder	" " " "
9	200	6	1	....	....	..	2 in.	" " " "
10	200	4	1	....	....	..	2 in.	" " " "
11	200	4	1	....	....	..	2 in.	" " " "
12	200	..	..	1:3:5	4	6	2 in.	Base completed
13	200	..	..	1:3:5	4	6	1½ in. 1½ in. binder	" "
14	200	..	..	1:2:3½	4	6	2 in.	" "
15	200	..	..	1:2:3½	4	6	1½ in. 1½ in. binder	" "
16	200	..	..	1:3:5	5	6	2 in.	" "
17	200	..	..	1:2:3½	5	6	2 in.	" "
18	200	..	..	1:2:3½	5	6	1½ in. 1½ in. binder	" "
19	200	..	..	1:3:5	6	6	2 in.	" "
20	200	..	..	1:2:3½	6	6	2 in.	" "
21	200	..	..	1:2:3½	7	6	2 in.	" "
22	200	..	..	1:2:3½	8	6	1½ in. 1½ in. binder	" "

§ Novaculite.



TEST HIGHWAY, LOOKING EAST FROM MID-LENGTH. ROAD PARTLY GRADED. RAILROAD ON THE SOUTH

vision, but only four rods, two near the outside edges and two near the transverse dividing planes of each sub-section.

It will be noted that in sections 45, 46 and 47, where the slabs are 6 inches thick, reinforcement is one inch above the mid-depth of the slab, while in the case of the 5-inch slabs in sections 48, 49 and 50, the reinforcement is ½ inch above the mid-depth of the slab and the lower edge of the reinforcing rods but ⅛ inch above the mid-depth of the slab.

CONCRETE WEARING SURFACE

Section No.	Length of section	Coarse aggregate	Mixture	Thickness, inches	Other materials used	Dividing planes	Type of reinforcement	Condition January 1, 1921
40	200	Crushed limestone	1:2:3½	9	.....	None	None	Completed
41	150	" "	1:2:3½	8	.....	Transverse & longitudinal	None	"
42	150	" "	1:2:3½	8	.....	None	None	"
43	150	" "	1:2:3½	7	.....	Transverse & longitudinal	None	"
44	150	" "	1:2:3½	7	.....	None	None	"
45	100	" "	1:2:3½	6	.....	Transverse & longitudinal	a	"
46	100	" "	1:2:3½	6	.....	" "	b	"
47	100	" "	1:2:3½	6	.....	Transverse	a	"
48	100	" "	1:2:3½	5	.....	Transverse & longitudinal	a	"
49	100	" "	1:2:3½	5	.....	" "	b	"
50	100	" "	1:2:3½	5	.....	Transverse	a	"
51	100	" "	1:2:3½	6	.....	None	c	"
52	200	" "	1:2:3½	6	.....	None	None	"
53	100	" "	1:2:3½	5	.....	None	c	"
54	200	" "	1:2:3½	5	.....	None	None	"
55	200	Gravel	1:2:3½	5	.....	None	None	"
56	200	Crushed limestone	1:2:3½	5	4% calcium chloride 2½% " "	None	None	"
57	200	" "	1:2:3½	5	Cemite cement	None	None	Rough graded and about 45 feet of top laid
58	200	" "	1:2:3½	*4	.....	None	None	
59	200	" "	1:2:3½	4	Cemite cement	None	None	
60	200	" "	1:2:3½	4	2½% calcium chloride	None	None	
61	200	" "	1:2:3½	4	.....	None	None	
62	200	Gravel	1:2½:3½	4	.....	None	None	
63	200	Crushed limestone	1:2½:4½	4	.....	None	None	
64	200	Gravel	1:2½:4½	4	.....	None	None	

* Rolled stone base.

The apparent purpose of extending the reinforcing entirely across the 18-foot width is to hold together the two halves produced by the longitudinal dividing planes. The variations in position of the reinforcing rods should show the value of the rods in reinforcing corners of slabs, whether of sections or of subsections, as combined with the corrugated division sheets; whether the two transverse rods in each sub-section of sections 47 and 50 will be sufficient to prevent longitudinal cracks; whether the longitudinal dividing planes will localize longitudinal cracks; whether the circumferential reinforcing in the 25-foot by 9-foot sub-sections will overcome the tendency toward secondary cracks and breaking and disintegration of cracks, whether of slabs, sub-sections of slabs or intersections of cracks with each other or with edges of slabs or sub-sections.

The letter *C* refers to reinforcement with wire mesh which weighs about 45 pounds per 100 square feet. The total effective longitudinal sectional area per square foot of width is 0.93 sq. in., and the sectional area of the longitudinals per foot of width is 0.087 sq. in.

BRICK PAVEMENTS

These pavements vary in the kind and size of brick used, depth of macadam base and number of courses of macadam, mixture of concrete base and thickness of same, the presence or absence of 6-inch curb, kind of filler, and nature of cushion. In many of the sections lug and lugless brick were laid in alternate 100-foot sections. Sand cushion was used in some cases and mastic cushion in others as indicated. Bituminous filler was used for all sections except 33 to 39, for which cement grout filler was used. Sections 33 to 39 are all of lug brick, 4 or 3 inches thick and all are laid monolithic except section 34 which is semi-monolithic with a ¾-inch cement-sand bed. For the base concrete aggregate, crushed limestone was used. The base varied in thickness from 2 inches to 6½ inches.

ASPHALTIC CONCRETE PAVEMENTS

In the asphaltic sections the wearing surface is Topeka mix, in some sections 2 inches thick, in others 1½ iches thick with a 1½-inch binder. The concrete base is provided throughout with 6-inch integral curbs. The macadam base for the six sections varied from 4 to 10 inches with one 4-inch novaculite base; the 8-inch and 10-inch macadam base being laid in two courses. The cement concrete base was 4 inches thick in four sections, 5 inches in three sections, 6 inches in two sections and 7 inches and 8 inches in one section each. Of the several sections having the same thickness of base, either the proportion of the mixture or the nature of the wearing surface varied in the different sections.

The last column of each table shows the condition of the various sections on January first of this year. It is seen that about two-thirds of the concrete pavement has been completed, about one-third of the brick and none of the asphalt. It is presumably the purpose of the department to finish these as soon as the weather will permit this spring and then to begin the testing of the road by sending over it trucks with loads gradually increased until they exceed the state highway regulations by 50 per cent, careful study of the several sections being made con tinually by means of the appliances and provisions already described. Mr. Older has promised that not only the construction of the various sections of pavement, but also the methods and results of these observations, will be published at intervals in a bulletin.

Ohio State Road Contracts Held Up

Contracts for $3,000,000 of highways, including 10 miles of the national pike between Columbus and Springfield, the improvement of North High street in Columbus and a Franklin county road contract that has already been attacked in the courts, were awarded by the State Highway Department December 31, the contract signed and surety bonds accepted on January 10, one day before former State Highway Commissioner A. R. Taylor was dismissed by the new governor. The new highway commissioner, Leon C. Herrick, has been instructed to hold up the contracts.

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Modifying Construction Methods

No two large construction jobs, even though as far as possible of the same dimensions, design, type, details and under similar conditions, prove to be exact duplicates when the work is executed, even if they are both done by the same contractors, with the same general equipment, and under the same engineers. No matter how closely it is intended to follow precedents, and to use standard plant and equipment, methods and operations, difficulties, unforeseen conditions or combinations may arise, changes may be required, labor, materials or machinery may be more or less available or accidents may occur that make methods and machinery, ordinarily most efficient, inadequate or unsatisfactory. Comprehensive changes or replacements are likely to be difficult and costly and to delay the operation. The engineers and contractors who in such cases are quick to devise expedients and, grasping the principles involved, can apply scientific and mechanical methods to meet the changed conditions and produce the required results with minimum delay and expense, will be rewarded by a completion of the work more rapidly and economically than would otherwise be the case, sometimes thus securing considerable saving, or avoiding heavy expense.

Such modifications do not generally imply costly or elaborate changes; they are usually simple alterations, rearrangements and adaptations of existing methods and equipment or are produced by using some familiar tool or operation for a new purpose.

The successful solution of these construction problems involves ingenuity, quickness and a thorough knowledge of the subject with experience in handling similar work that makes for good judgment and confidence. The ability to devise and apply such improvements in an emergency is a valuable one that is possessed in large degree by some men and that can be cultivated by most others that are fitted at all for directing construction work. A competent constructor can scarcely visit even the most well-conducted construction work under other management without observing some detail which might be modified or improved to advantage. This talent is cultivated by familiarity with the published methods of constructing work of all kinds that may be available.

Excellent examples of these practical devices are given on page 163 in the description of methods of submerged excavation inaccessible to the dredges and for driving inclined piles without complicated apparatus.

A Good Beginning on Housing Extortioners

The conviction, February 3 in the Supreme Court, New York City, of Robert Brindell for extortion, is a good beginning for the Lockwood Committee now investigating corrupt practices that have so greatly impeded housing and other construction not only in this region but in the principal cities throughout the country.

The testimony so far made public shows incredible depravity and audacity met with surprising non-resistance and a wide-spread collusion limited only by the necessities and resources of the public who have been mercilessly outraged and defrauded on every side.

Brindell and his like have dictated drastic terms and have enforced them by complete financial ruin of those who would not submit to them. Their stealings have been enormous, and up to now they have safely gotten away with them. The robbery has been combined with treachery to their associates and alleged friends and with the influence and im-

munity secured by their huge gains they have exercised great power and become a serious menace to construction, industry, and the general public.

It is to be earnestly hoped that this conviction is only the forerunner of a series that will wipe out the disgraceful conditions and punish to the utmost the criminals invovled throughout the country. Municipal, state and federal authority should unite in most vigorous prosecution of this organized crime and the labor unions especialy should purge themselves absolutely of all the remaining traces of the practices now exposed that discredit every honest man affiliated with the labor interests.

The same should be done unsparingly with all who have dishonestly conspired among the dealers and among any others who have participated in the crimes by collusion with the principals. Incidently it is or should be, astonishing that otherwise reputable lawyers or business men should defend or excese the criminals. No individual or organization open to suspicion of implication in these conspiracies is entitled to confidence until he or it has vigorously and publicly disproved the accusation.

Winter Transportation

For the first time in five years there is a temporary surplus of box cars and freight locomotives which the railroads of the country immediately utilize by moving all the freight possible that ordinarily would wait until next summer, when it would suffer delay from the congestion that it would help to create, which has been the common experience of previous years.

It is computed that $1,394,000,000 is available for highway construction in 1921, and of this amount the Bureau of Public Roads estimates that possibly one-half will be actually expended during the year. Assuming that only $500,000,000 will be spent and that the road work done will cost $50,000 per mile (some of it will cost very much less), there is a minimum of 10,000 miles of highway construction or its equivalent to be done in the next eleven months, which it is conservatively estimated requires the transportation of 100 carloads of equipment and materials per mile, a total of 1,000,000 carloads.

If this is all demanded between May and September, when most of the work is commenced, its transportation will very greatly interfere with other freight traffic and cause delay and loss not only to the road builders but to other shippers. Similar conditions prevail to some extent in all kinds of engineering and heavy construction work, and it is obvious that all of this class of freight that it is possible to receive in advance, should be ordered shipped as quickly as possible so as to take advantage of the present surplus of transportation facilities and prevent later congestion and delay. It is improbable that there will be any reduction in the prices of materials and equipment sufficient to offset the advantages thus gained, and it may even be justifiable in some cases to incur storage and rehandling charges in order to be certain of transportation in advance.

Brindell Convicted

Robert Brindell, the most conspicuous subject of the sensational investigation by the Lockwood Senate Committee on the housing situation, has been convicted of extortion and sentenced to an indeterminate term of from 5 to 10 years' imprisonment at hard labor.

The offense was unusually flagrant and involved the robbery of many tens of thousands of dollars besides enormous damage to important construction operations and discrediting and injuring many innocent parties. It is most regrettable that the maximum penalty of 15 years was not imposed and that the restitution of hundreds of thousands of dollars of extorted money was not accomplished.

It is very significant that although the testimony indicated that Brindell had not been loyal to some of the unions, a mob of hundreds of union men, after his conviction, gave him an enthusiastic greeting and promised him support and release.

Following the Brindell conviction John T. Hetric, lawyer, the originator of the "code of practice" system of collusive bidding, has been put on trial in the Supreme Court.

Frederick William Shepperd

After an illness of two months Frederick William Shepperd, founder and for thirty-three years proprietor of *Fire and Water*, died at his residence, in Brooklyn, on February 8, 1921. As a pioneer in trade journalism and the leader in technical journalism covering fire protection and water supply, he was thoroughly conversant in all lines of water works and fire protection. Mr. Shepperd always stood foremost in progressive movements for the betterment of water works and fire protection. He came out strongly for universal meterage of water for domestic use, and this is but one example of his fearlessness in comnig out boldly for any movement which he saw would ultimtaely benefit the fields he served.

He was an honorary member of the New England Water Works Association, a member of the American Water Works Association and an associate member of the International Association of Fire Engineers.

Alfred T. White

Alfred Treadway White, commissioner of public works of Brooklyn, 1893-94, was drowned while skating January 29. Mr. White was a graduate of the Rensselaer Polytechnic Institute, Troy, and the Brooklyn Polytechnic Institute, and a member of the Brooklyn Engineers' Club. In 1876 he built the first successful tenement houses in this country, for which he received from Harvard University the honorary degree of Master of Arts. He was a member of the Tenement House Commission and of the New York Chamber of Commerce and various clubs and was a prominent philanthropist.

Obstacles to Construction Operations

Editor of PUBLIC WORKS.

Dear Sir: I have read with interest the letters from Mr. Conners, Mr. Newton and Mr. Crane and the editorials in PUBLIC WORKS, January 15 and 22 on "Obstacles to Construction Operations," etc. I think each article was well written and the thoughts worth while, but you and every man must consider the meagre influence by that which is sincere and honest in these times.

I approve of the hammering all the time on that which is good and right, but it seems that it requires lots of hammering to drive a few nails of truth where they will hold. I am not at the age when I wish to say the former times were better than these, but I remember that when I wished to build a home the contractors came to me with plans and specifications and said "we will do this for so much," and then took pride in their work. Is there that pride now? Do men do their work with the desire of producing a thing to be proud of or for the gain they can get?

The present tendency seems to be to cheat, to scheme, and plan to do the least for the most money. This is not in the contractor alone, but it is from the hod carrier to the overseer. The spirit of "beat the game" seems to prevail. The laws are made by lawyers for themselves and their clients and the courts decide that many are unconstitutional if they do not fit the cases. Laws cannot make men honest, or fair, or decent. Where law is a necessity it should be so strict that none would violate it. The man who would put up a dishonest or dangerous building should be punished hard.

Then men are a lot of children—they are willing to let someone do the thinking for them. So we have labor making a fool of itself. An organization that will permit itself to fall into the hands of a few self-asserting and unscrupulous men is not worthy of the honest worker.

They should work together for mutual good, and when they permit themselves to be bullied by a few they cease to be men and become dumb driven animals. The idea that men can use an organization to their own ends is unbelievable. Why should such be the case? Because men are too lazy to think for themselves. If I belong to a union should I not know what it is doing? If there are plans to be considered should I not know them? Why should I let one, two, or three men do the thinking for me?

Then it should be the pride of any organization to teach its members to be loyal to their co-workers and also to their employers. What right has a man to try to beat his employer out of his honest labor? I repeat that we are trying to do things by passing laws when we have so many laws that we cannot live up to them if we wished to. We would be better off if instead of passing laws we let our legislative bodies spend two years studying what laws could be repealed with benefit.

It seems to me that fundamentally back of all the trouble is that patent fact that we are deficient in our educational methods. We devote time to things that are of little value and neglect that which is important. I cannot go into this now, but we can at least teach the young that the greatest thing is to do honest work, put forth effort worthy of praise and that they should give as they would like to receive.

Less law, more honesty, and less of the trying to do the other fellow.

Yours sincere,
P. DAVID SHULTZ, M.D.

Economical Plant on Concrete Road Construction

In constructing a reinforced concrete road near Siegfried, Pa., the Arthur McMullen Co., of New York, made use of an equipment which cut the labor cost per square yard down to $.28 on the record day, when 576 lineal feet of 18-foot road averaging 7⅛ inches thick was laid with a payroll cost of $331.75 for a 9½-hour day, equivalent to 24½ cubic yards per hour.

The contract calls for 28,800 feet of reinforced concrete road 18 feet wide, 8 inches thick at the center and 6 inches at the edges, reinforced with wire mesh weighing 25 pounds to the square yard, placed two inches below the surface. The reinforcing of the concrete, which requires practically placing the concrete in two layers, adds to the time required for constructing the road. The concrete was mixed 1:2:3 with a 1¼-minute mixture.

The superintendent for the contractor, R. P. Johnston, found that it would cost approximately $35,000 to install an adequate industrial railway system, while for $10,000 he could obtain sufficient trucking equipment, including 7 one-ton dump-body trucks, and the latter plan was adopted. Cement was placed at convenient intervals along the roadway and the sand and crushed stone were hauled an average of about a mile by these trucks from the material bins. On reaching the mixer, the trucks were run onto a simply designed turntable which was placed just in front of the loading skip. The truck was then turned by hand by two or three men so as to bring the rear end over the skip, the load was dumped and the truck run off of the turn-table. At each movement of the mixer, which was made about once for each 20 lineal feet of road laid, the turn-table was moved by hooking it to one of the trucks, which dragged it to the desired position. Only a few seconds were required for placing the turn-table in position. Concrete was mixed by a Smith 21-E boom and bucket paving mixer.

Ideal Section of Lincoln Highway

In our issue of May 15, 1920, we referred to the plan to construct at some point on the Lincoln Highway an ideal section of road and the appointment of a committee of experts to prepare plans for such section. It is reported that this committee has decided on most of the points for this ideal section, the following ones having been adopted subject to review at the final meeting of the committee:

The specifications are to be predicated upon an average traffic of 15,000 passenger automobiles per 24-hour day, traveling at a speed of 35 miles an hour, and 5,000 motor trucks traveling at an average speed of 10 miles an hour; with a maximum load of 800 pounds per inch of width of tire actually in contact with the road surface, and 8,000 pounds per wheel. (When traffic exceeds these limits, it is considered desirable to construct another parallel road rather than increase the width or strength of the existing road with a view to concentrating additional travel upon it.)

The right-of-way should be 100 feet wide. Submerged drain tiles and catch basins should be used for drainage instead of side ditches. The pavement selected is concrete, reinforced, 10 inches thick, with earth shoulders. Curves should be as few as possible and none with a shorter radius than 1,000 feet, and should be super-elevated for a speed of 35 miles an hour. There should be a foot path for pedestrians, guard and

warning signs, and guard rails at all embankments. All crossings at grade should be eliminated and all obstructions to vision should be removed at intersecting roads for at least 500 feet each way from the intersection. Comfort stations, park sites and camp sites should be established. All wires should be placed underground. Advertising signs and all signs of direction or distance except those placed or authorized by proper state authorities should be prohibited, and all distance markings should originate at the municipal headquarters of the town or city referred to. The section should be lighted, and adequate, intelligent, continuous and prompt maintenance provided.

All of the decisions were unanimous except that one member dissented from the limit of total travel and one from the limit of load. Practically the only point upon which there was disagreement was that of the cross-section, that is, the number and arrangement of traffic lanes, some recommending a three-traffic lane pavement, 27 feet wide, others four-traffic lanes, separated by a central parkway, and still others separate travel lanes for motor trucks and for passenger cars. Plans and specifications are being drawn up for each of these ideas and this matter will be carefully considered at the next meeting of the committee.

Drainage in Port Arthur

Probably best surface drainage of any south-western city. Both surface and house sewage pumped. Rainfall and run-off data collected.

About a year and half ago the city of Port Arthur, Texas, voted a bond issue of $270,000 for street improvement, of which $35,208 was to be used for surface drainage. Many miles of gutters and main drainage ditches were opened and city engineer Clarence E. Ridley states in his last report that the city probably has the best surface drainage system of any city similarly situated on level ground and without storm sewers.

Drains lead to three pumping stations. The largest of these is equipped with three 48-inch Wood screw pumps, which connect to a 100-horse power Fairbanks-Morse crude oil engine. The pumps are designed to operate against a 5-foot head, against which two of them will lift 40,000 gallons a minute and the third 55,000. The first two will pump against a head of 11 feet and the third will operate efficiently only to a 7-foot head. This station is operated daily to remove the seepage water and maintain the water in the ditches at a low level. During the last fiscal year 2,379 million gallons were pumped at a cost of $2.09 per million gallons. The cost of pumping during the latest fiscal year was about 33 per cent less than the year previous, the decrease being due mainly to the installation of a fuel oil storage tank. Before the fuel oil tank had been built the city paid 12 cents a gallon for fuel oil in barrels, but paid only 5½ cents a gallon for the same grade of oil in tank cars. The tank has a capacity of 13,000 gallons.

One of the other stations is equipped with two one-million gallon per hour Menge centrifugal pumps, each gear-driven by a 75-horse power motor, these pumps being used only in time of rain to quickly drain the business sections of the city. This station operated about 358 hours during the year and pumped about 358 million gallons. The third station contains one Menge centrifugal pump of one million gallons per hour capacity and this also is operated only in time of heavy rain, its purpose being to relieve the central station. There is no special operator for either of these two smaller stations, but one of the men of the department is detailed to operate it when the rain makes it necessary. At the end of the fiscal year there were drainage ditches totaling 23 miles within the city limits. These have to be kept clean and graded. In addition to the small ditches there are canals so large that machine work is needed to economically grade and clean them.

In addition to the ditches and canals, the city contains 4 miles of storm sewers ranging in size from 8 inches to 42 inches.

While rainfall data had been collected with a view to preparing a complete storm sewer design, the matter of percentage of run-off had not been investigated, although it was recognized that the fact that practically all of the water draining to the ditches was pumped, offered an excellent opportunity for making such studies, and it was hoped that this opportunity would be taken full advantage of during the next fiscal year. However, some data had been obtained for the entire city taken as one unit with an area of 2,320 acres. Taking the total run-off for each of the twelve months as the total amount of water pumped during such month, the percent of run-off from the area that was pumped varied from monthly records of 38 per cent in April to a maximum of 104 per cent in March, the average for the year being 68 per cent. It was noted that the percent of run-off varied directly as the intensity of rainfall but not in proportion to the quantity for any one month. The 104 per cent run-off was explained by the fact that a small amount of rainfall followed a rainy period, the seepage for the latter continuing during the period of the former.

The house sewage of the city also requires to be pumped, there being three pumping stations for this purpose. The total amount of house sewers in the city at the end of the fiscal year was 31.29 miles of sizes from 6-inch to 18-inch. On one occasion during the year a 4,000-foot line of 12-inch force main leading from one pumping station to the canal became plugged, but was flushed out by means of city water pressure. One of the stations pumped 114 million gallons during the

year, another station 4 million and the third station 100 million. Although the third pumped nearly as much sewage as the first, it was estimated to serve only 1,878 persons as against 8,322 served by the first, or 4½ times as many gallons per capita. The cost of pumping averaged $6.80 per million gallons at the first station, $17.10 at the second and $22.73 at the third.

The city engineer, in his report, says: "A close inspection of the sanitary sewers convinced us of the fact that more careful supervision must be exercised if the health of the citizens is to be held supreme. The sewers show large deposits of sand and clay. The entrance of this material must have been gained through loose and poorly laid joints or through house connection stubs which were not carefully made. It is not the intention to cast reflection upon anyone nor to place the responsibility, but I feel that it is necessary to state that the sewer extensions laid here during 1917 and 1918 were not first-class by any manner. In fact, the design, as well as the construction, was inferior in many ways. The repair jobs which it has been necessary to make during the last year, one of which cost nearly $1,000, were due entirely to inferior workmanship when the original installations were made.

"With regard to the design, in the majority of places manholes are 1,000 feet or more apart. In cleaning the sewer it is necessary if the obstruction is at all bad, to construct a manhole to enable the men to properly carry on this work. Each month the sewers are getting worse in condition, and the first remedy is to build more manholes to allow the cleaning process to follow economically."

Milwaukee Water Works

The water works of Milwaukee, Wis., was the subject of a report issued by the National Board of Fire Underwriters under date of December 11, 1920, which report is very commendatory of the works and department.

After giving a general description of the several features of the plant, the investigators sum up their findings in a set of conclusions from which the following are quoted:

"The water department is well organized and the officials are well qualified for their duties.

"Plans and records are complete and in convenient form.

"The present supply works are in good condition, and with the two separate intakes provided, there is slight danger of interruption.

"The pumping stations are in good condition; they are not fireproof, but contain little combustible material and the fire hazard is slight. Pumping and boiler capacity is sufficient to allow for proper reserve and the equipment is in good condition and efficiently operated. Steam pipe in both stations is well arranged, being practically in duplicate.

"The reservoir is in good condition; its capacity, equal to about ⅓ day's consumption, is sufficient to equalize supply during temporary large drafts.

"The per capita consumption is moderate, due to the large percentage of meters." (More than 99 per cent of the services are metered.) "The department is using proper measures to reduce the use of water on the unmetered services.

"Pressures are fair and are well maintained at the pumping stations and in the congested value district."

After stating the amounts of water necessary for good fire protection, the report says: "Fire flow tests showed that these quantities are generally available; but they also showed the effect of the lack of connections between small mains, which results in a poor supply to some hydrants.

"Main arteries and secondary feeders are generally adequate and fairly well arranged except in some of the outlying districts. The percentage of 6-inch pipe is too large, a particularly bad feature in this system where, in many localities, small mains are connected to each other only at long intervals.

"The interior condition of the pipes is good. Valves are in good condition. Hydrants are of satisfactory size and are maintained in generally good condition.

"Separate high-pressure fireboat lines form a valuable addition to the protection in the congested value and manufacturing districts along the rivers and canals.

"The construction of the new intake has added very materially to the adequacy and reliability of the system."

The report contains a number of recommendations, such as that the proposed new tunnel and pumping station be constructed as soon as feasible; that the pumping stations be rendered thoroughly fireproof; that a few larger mains of 12-inch to 20-inch diameter be installed; that for the future, 6-inch and 8-inch mains be adopted as a minimum for hydrant supply in residential districts and 8-inch to 12-inch for mercantile and manufacturing districts, the smaller to be used in each case only in sections where the mains form a complete gridiron; that more gate valves be added so as to reduce the length of line that must be cut out in case of accident or repairs; that fire hydrants be provided with gates on the connections to the mains; that, in important mercantile and manufacturing districts, two hydrants be placed at each street intersection and one midway between intersections where the distance exceeds 400 feet; while in other districts there be one at each street intersection and one at an intermediate point where the blocks are over 400 feet long. Only one recommendation, however, is indicated as being very important and urged for early adoption, this being that "Dead ends be eliminated wherever practicable, large mains frequently connected to distributers at intersections, and long unsupported lines of pipe cross-connected, so that not more than one hydrant will be on a 6-inch main between intersecting lines, and not more than two hydrants on an 8-inch main between intersecting lines."

million gallons were pumped at a cost of $2.09 stations pumped 114 million gallons during the

Salt Lake City's Public Works in 1920

Salt Lake City's expenditures for public improvements were greater during 1920 than during any previous year, according to the city engineer, Sylvester Q. Cannon, the expenditure for this year being $1,938,000, as compared with $700,000 for 1919. Of the sum spent, $586,200 was for water supply; $872,400 for paving $109,200 for curbs and gutters, $44,600 for sidewalks, $88,600 for storm sewers, $56,700 for sanitary sewers, $35,400 for bridges, $21,900 for operation of lighting districts, $7,500 for water mains and $115,500 for maintenance and routine work and miscellaneous improvements. In spite of the increase of work in 1920, the actual expense of conducting the city engineering department was $32,000 less than in 1919.

Farmers Oppose Good Roads in Kansas

Under the present arrangement the government pays one-half of the cost of new roads in Kansas. Under the plans of Governor Allen and the good roads advocates, the government would continue to pay one-quarter the cost and the state would pay one-quarter from the proceeds of motor car licenses. The remainder would be paid by the counties and townships through which the roads run.

For the past nine months the State Highway Commission has refused to permit contracts for hard road surfaces to be let on account of high prices, and does not intend to award these contracts at present, but desires to go on with the preparation of sub-grades ready for surfacing when prices become reasonable.

This program is violently opposed by the farmers' uinon, which demands that the legislature shall not provide state aid for hard road building for at least two years. A bill to this effect was passed in the House of Representatives by a vote of 65 to 55, but it is believed that there is no prospect of the bill being passed by the Senate.

Fixed Fee Form of Building Construction

In a paper before the New Orleans Convention of the Associated General Contractors of America, F. A. Wells, vice-president Wells Bros. Construction Co., Chicago, says:

"I believe the fixed fee form of contract accomplishes the two most important objectives:

"First, It will attract to the construction industry men of integrity, capability and responsibility. When this has been fully accomplished the second objective will be realized.

"Second, It will produce for owner, architect and engineer the best possible building for the least possible cost in the shortest period of time commensurate with quality; all made possible because the builder shares their interests under the fixed fee form of contract.

"The objective of the Associated General Contractors must be to place general contracting as a whole on the highest possible plane of responsibility. We must not be the three-ball depository of the gains of the 'artful dodger,' but the national banks of integrity and ability to which owners can come with confidence when they need to draw upon our services."

Snow Removal in Boston

The Mayor of Boston has proposed that private citizens, firms and corporations, and especially certain public service corporations, should co-operate with the city to make the highways passable and safe for horses, notwithstanding snow and ice. tI was determined to make a beginning with Atlantic Avenue, a broad business thoroughfare three miles or more in length.

An agreement has been made by representatives of the Master Truckmen's Association, the Boston Elevated Railway Company, and the Union Freight Railroad Company, which operates a nocturnal freight car line on the avenue, for the thorough and prompt removal of snow from this highway during or immediately after any considerable fall of snow.

Flat surface cars will be used for a great part of this work, but the truckmen will use their horses, hitched to sleds made expressly for the removal of snow and loaned to them by the Boston Elevated Railway Company. Five hundred of these sleds are available. The truckmen's part of the avenue will be divided into about thirty districts, and each district will be assigned to a particular master truckman. By these combined efforts it is expected that the avenue will be cleared in eight or ten hours after the heaviest fall of snow, and attention can then be paid to the intersecting highways.

The spreading of ashes and sand on icy streets will follow the same co-operative plan. The ferry service will attend to the streets running from the ferries to Commercial street; the State House will look after the various streets upon which the State House premises abut; school-house janitors will put ashes or sand on the streets in front of the school buildings and yards; churches, hotels, libraries, apartment houses, office buildings, department stores will be called upon to do their share, and, in many cases, the owner or occupants of private houses have agreed to roll out their ash-barrels and distribute the contents where they are needed.

To carry out this project the Mayor has appointed two committees composed partly of city officials and partly of private citizens, the secretary of the Team Owners' Association being made chairman of the committee on snow removal, and the president of the Boston Workhorse Relief Association being appointed chairman of the committee on the spreading of ashes and sand.

To Vote on Purchase of San Francisco Water Works

By a vote of 13 to 2, the San Francisco Board of Supervisors decided on January 18 to hold a special election on Tuesday, March 8, to submit to the electors a proposal to purchase the Spring Valley Water Co. and to authorize a bond issue of $38,000,000 for the purpose.

Construction Questions Answered

Suggestions as to methods, "wrinkles" and appliances that may be used to overcome difficulties arising in construction work. We invite questions concerning such problems that may arise from time to time in the experience of any of our readers. Answers prepared by competent authorities will be published promptly. It is hoped that ohters who have solved similar problems different will send us their solutions for publication also; or describe new "wrinkles." If it is only a new way to drive a nail, it may help some one.

How Can a Builders' and Contractors' Get-Together Club Be Organized and Financed? II*

Typical form of constitution, serving as a basis for modification to suit conditions.

The constitution should be simply an expression and definition of your aims and the regulations that you think desirable. In default of any other guide it may be helpful to consider a tentative outline like the following, which will afford suggestions for the principal features and enable you to accept, reject or modify them as you please.

Constitution

Article 1—Name, Place and Purpose.

Name—CONTRACTORS' AND BUILDERS' CLUB of Cincinnati.

Location—Committee room 3 of the City Hall, Cincinnati.

Purposes—Social intercourse, exchange of opinions, discussion of the general interests and the promotion and development of general building and contracting operations.

Article 2—Members

Active Members—Shall be contractors who are engaged in some branch of practical construction work in building or contracting operations of an average yearly value of $50,000 or more and must be resident or have a business office within twenty-five miles of the center of the city of Cincinnati.

Associate Members—May be engineers, architects, lawyers, retired builders or contractors, or others engaged in business closely affiliated with the interests of builders or contractors and who are not engaged or interested in any business or occupations or affiliated with any interest or organization likely to rival, oppose, or be inimical to the interests of builders or contractors.

Honorary Members—May be any person eligible to active or associate membership residing at any distance from the club and who are especially distinguished for achievements in construction, who have rendered signal services to the club or whom the club may wish to honor.

General—Members of all classes must be citizens of the United States, of good moral character, of good business standing and twenty-five years or more of age and must have signed the constitution and by-laws and paid the initiation fee.

Article 3—Election of Members

Admission—Candidates for active associate membership must file an application stating age, residence, amount of business, citizenship and must be endorsed by at least three members of the club. After the application has been posted in the club rooms or notice has been served by letter on all of the members of the club for at least thirty days the application shall be voted by sealed ballot enclosed in endorsed envelopes and five per cent negative of the ballots cast shall exclude. If rejected a candidate cannot apply again for election within twelve months.

Honorary members shall be proposed by the board of direction and voted on at any regular meeting after notice has been given at the preceding meeting. One negative vote shall defeat any candidate for honorary membership.

Expulsion—Written charges may be preferred against any member and shall be considered by the board of direction. If this, on investigation, may prove to be sustained the board shall report to the club with recommendation and expulsion can be secured only by the majority of three-quarters of all the club members.

Membership shall automatically cease when dues are more than two years in arrears.

Article 4—Fees and Dues

All active members shall pay an initiation fee of $5, which shall include the dues for the first calendar year, and shall afterwards pay yearly dues of $5.

Associate members shall pay an initiation fee of $10 and after twelve months annual dues of $10.

Honorary members shall be exempt from all initiation fees and dues.

Any member can at any time compound his dues and initiation fees by a payment equal to ten years' regular dues.

Article 5—Officers

Officers of the club shall consist of President, Vice-President, Treasurer, Secretary and five Directors.

The officers of the company shall be elected by letter ballot on the last regular meeting of every calendar year and shall hold office until their successors are elected and qualify.

Their duties shall be those generally devolving on such officers in similar organizations.

The Directors shall consist of President, Vice-President, treasurer and Secretary ex-officio, and of five other members with each representing one of the five other principal trades or interests embraced in the membership of the club. At the first election four shall be elected for one year, and four for two years and at the expiration of these terms the Directors shall always be elected for a two-year term.

Article 6—Committees

The President shall appoint standing committees of three or five members each as follows: House committee, membership committee, executive committee, entertainment committee, committee on plans and specifications, committee on methods, operations and practice, committee on improvements, committee on law, committee on plant and equipment.

Article 7—Meetings

Regular meetings shall be held in the club rooms at 8 p. m. every Monday, except holidays.

Special meetings shall be held the first Monday of each month, excepting holidays, for the discussion of important subjects or the presentation of papers.

Ladies' nights, receptions, lectures or special entertainments, shall be held at the discretion of the entertainment committee.

The annual meeting, including a dinner or excursion, or both, shall be held during the month of January as arranged by the executive committee and the committee on entertainment.

Article 8—Amendments

Proposed amendments to the constitution must be signed by at least five active members in good standing, must be mailed to each member of the club at least ten days before the meeting at which it is announced for discussion and

*Part 1. Preliminary operations; preparations for first meeting; arrangement of formalities; adoption of constitution by charter members; payment of initial expenses; financing and optional incorporation, was published February 12.

must be voted on by ballot at least one week after the discussion in regular meeitng. A majority of three-fourths of the votes cast is required to carrv the amendment.

By-Laws

Any additional regulations concerning the character of the papers and addresses, the duties of officers and committees, the activities of the club, the control of its property, and its programs and all routine matters will be provided for in by-laws.

One of the principal features of the by-laws is to fix a regular program of business at regular meetings and at special meetings. The program for regular meetings may consist of (1) roll call, (2) reading and approval of previous meeting, (3) special business, (4) unfinished business, (5) new business, (6) report of committees, (1) election of members, (8) paper, address or discussion of the evening, (9) adjournment.

At the annual meeting there should be an address by the incoming and outgoing presidents, reports of the secretary and treasurer and of all standing committees, election of officers, amendments to constitution, if any, and other important business.

Such an outline as the above is sufficient for a large and prominent organization. Very much less will suffice for a tentative organization which may omit a large part of the details here enumerated. They are, however ,useful in giving a line on the points most frequently developed in organizations of this character and in affording a basis of elimination or changes suited to the local condition.

LECTURES AND ADDRESSES

An impetus may be given to the club that will give it local prestige and aid its early growth by inviting prominent men, distinguished for their success in construction lines, to address it on special occasions when something of an event can be made by engaging a public auditorium, issuing invitations to individuals and local or neighboring societies ,holding a smoker, reception, dinner, etc.

You can thus have after-dinner addresses or descriptions of some special or important works, like, for instance, The Quebec Bridge, The Catskill Water Works, Difficult Foundations, Construction of Concrete Buildings or Bridges, Highways, Skyscrapers, etc., etc.

Consulting engineers, contractors, architects, city officials, college professors and others familiar with construction and industrial subjects are often willing to help in such matters and some of them have very attractive stereopticon slides to illustrate their remarks.

The club will, of course, defray their traveling expenses and entertain them as guests while in town. No other compensation is usually expected for speakers from neighboring cities, but if the speaker comes purposely from a considerable distance he should receive an honorarium of $25 to $100 or, if he is a professional man, it may be arranged to find a client there for his consultation services. If he delivers a lecture, a commission to give other lectures for regular fees for some local city, or church, or society club, or other interest may be arranged for the same trip, and thus compensate him for valuable time with little outlay for your club.

Texas County Road Bonds

During the year 1920 33 counties in Texas issued bonds totaling $7,879,000 for road construction, an average of nearly $240,000 per county. The State Highway Department does not guarantee that there may not have been issues of bonds which are not known of in calculating this total. The largest amount issued by any one county was $1,500,000 by Montgomery Co., the next largest was $1,000,000 by Coryell Co., while the smallest in the list was $20,000 by Hood Co.

Specifications for Massachusetts State Highway Work

The New England Road Building Association recommends that the limit of free haul on both excavation and borrow should be 1,000 feet, the length of haul to be figured from the borrow pit or place of excavation to the place of deposit, and that the price on overhaul should be increased to at least one cent per cubic yard per 100 feet.

Pavements Laid During 1920 *

Quantities are square yards or miles unless otherwise indicated.

Cities and States	Sheet Asphalt	Asphalt Concrete	Tar Concrete	Rock Asphalt: Bitulithic	Rock Asphalt: Bitoslag	Rock Asphalt: Rock Asphalt	Rock Asphalt: Warrenite	Rock Asphalt: Willite	Asphalt Macadam
Michigan									
Ann Arbor		20,000							
Detroit	45								
Flint	225,000								
Howell		21,386							
Hudson		14,027							
Jackson	135,000								
Lansing	50,000							790	
Minnesota									
Albert Lee				56,000					
Little Falls				29,000					
Minneapolis		21,349							
St. Paul	78,111	109,308							
Mississippi									
Clarksdale		38,000							
Missouri									
Batesville		106,000							
Sedalia									5
Montana									
Bozeman				20,000					
Great Falls				25,420					
Nebraska									
Hastings	64,000								
Lincoln	19,517	31,804							
Norfolk		40,000							
Red Cloud		25,000							
Nevada									
Reno				67,120					
New Hampshire									
Laconia			1,767.85						14,578
Portsmouth		4¾							

*Continued from page 155.

PAVING LAID DURING 1920—(Continued)

Quantities are square yards or miles unless otherwise indicated.

Cities and States	Sheet Asphalt	Asphalt Concrete	Tar Concrete	Bitulithic	Bitoslag	Rock Asphalt	Warrenite	Willite	Asphalt Macadam
New Jersey									
Bloomfield	.....	14,000	.....	.....	.....	.....	3,000	.....	.....
Camden	36,840	.....	.....	.....	.....	.....	.....	.....	.....
Elizabeth	.....	30,982.3b	.....	.....	.....	.....	.....	.....	.....
Garfield	.....	.....	.....	.....	.....	.....	.....	.....	51,936
Montclair	.....	.....	.....	.....	.....	.....	6,700	.....	2,000
New Brunswick	66,967	.....	.....	.....	.....	.....	.....	.....	.....
Passaic	11,750	.....	.....	.....	.....	.....	.....	.....	6,151
Paterson	.....	.....	.....	.....	65,000*	.....	.....	.....	.....
Plainfield	.....	.....	7,500	.....	.....	.....	.....	.....	.....
Red Bank	13,818	.....	.....	.....	.....	.....	.....	.....	.....
Rutherford	.....	.....	.....	.....	.....	.....	.....	.....	½
Somerville	.....	.....	.....	.....	.....	.....	.....	.....	19,600
South Orange	.....	.....	.....	.....	2,500	.....	.....	.....	.....
West Orange	1,000	.....	.....	.....	.....	.....	.....	.....	.....
New York									
Binghamton	.....	18,077.54	.....	.....	.....	.....	.....	.....	8,024
Buffalo	167,500	.....	.....	.....	.....	.....	.....	.....	.....
Geneva	.....	.....	.....	10,700	.....	.....	.....	.....	.....
Gloversville	.....	.....	.....	10,130	.....	.....	.....	.....	.....
Kingston	.....	.....	.....	.....	.....	.....	.....	45,000*	.....
Herkimer	.....	.....	.....	500	.....	.....	.....	.....	.....
New York:									
Manhattan	156,551	.....	.....	.....	.....	.....	.....	.....	.....
Brooklyn	432,000	.....	.....	.....	.....	.....	.....	.....	6,340
Bronx	97,404.1	.....	.....	.....	.....	.....	.....	.....	.....
Niagara Falls	.....	7,677.5	.....	.....	.....	.....	.....	.....	.....
N. Tonawanda	.....	.....	.....	10,130	.....	.....	.....	.....	.....
Oneonta	.....	.....	.....	.....	.....	.....	.....	.....	19,000
Rochester	40,950	.....	.....	.....	.....	.....	.....	.....	5,870
Troy	.....	.....	.....	15,000	.....	.....	.....	.....	.....
Watertown	2,693	.....	.....	.....	.....	.....	.....	.....	4,300
Waterford	.....	.....	.....	.....	.....	.....	.....	4,000*	.....
North Carolina									
Asheville	2,680	11,837	.....	.....	.....	.....	.....	.....	.....
Durham	18,713	.....	.....	5,758	.....	.....	.....	.....	.....
Fayetteville	15,000	.....	.....	.....	.....	.....	.....	.....	.....
Greensboro	.....	.....	.....	.....	.....	.....	4.09	.....	.....
Monroe	.....	1¾	.....	.....	.....	.....	.....	.....	.....
Statesville	76,000	6,200	.....	.....	.....	.....	.....	.....	.....
North Dakota									
Fargo	.....	40,426	.....	.....	.....	.....	.....	.....	.....
Ohio									
Akron	24 000	24,100	.....	.....	.....	500	.....	.....	.....
Bellaire	64,363	.....	.....	.....	.....	.....	.....	.....	.....
Cincinnati	.....	.....	.....	.....	30,000*	.....	.....	.....	.....
Columbus	3.8	.....	.....	.....	.....	.....	.....	.....	.....
Findlay	.....	1,547	.....	.....	.....	.....	.....	.....	.....
Fremont	4,193	.....	.....	.....	.....	.....	.....	.....	.....
Lakewood	.....	.....	.....	60,987	.....	.....	.....	.....	.....
Lorain	12,250	.....	.....	.....	.....	.....	.....	.....	.....
Marion	.....	14,000	.....	.....	.....	.....	.....	.....	.....
Xenia	40,000	.....	.....	.....	.....	.....	.....	.....	.....
Oklahoma									
Oklahoma City	87,979.9	22,525.4	.....	.....	.....	.....	.....	.....	.....
Oregon									
Astoria	.....	.....	.....	6,343	.....	.....	.....	.....	.....
Pennsylvania									
Allentown	30,393	.....	.....	.....	.....	.....	.....	.....	.....
Beaver Falls	.....	23,000	.....	.....	.....	.....	.....	.....	.....
Bethlehem	19,833	.....	.....	.....	.....	.....	.....	.....	.....
Bloomsburg	36,629	.....	.....	.....	.....	.....	.....	.....	.....
Chester	.....	2,704	.....	.....	.....	.....	.....	.....	.....
Harrisburg	16,220	.....	.....	.....	.....	.....	.....	.....	.....
Lebanon	.....	.....	.....	10,994	.....	.....	.....	.....	.....
Scranton	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wilkes Barre	10,447.04	.....	.....	.....	.....	.....	.....	.....	.....
York	13,726	.....	.....	.....	.....	.....	.....	.....	.....
Rhode Island									
Bristol	.....	.....	1,800	.....	.....	.....	.....	.....	.....
Woonsocket	.....	.....	.....	.....	.....	.....	.....	.....	49,000
South Carolina									
Dyerburg	12,868	19,251	.....	.....	.....	.....	.....	.....	.....
Tennessee									
Cleveland	33,293	.....	.....	.....	.....	.....	.....	.....	.....
Texas									
Belton	.....	.....	.....	.....	.....	.....	.....	.....	3.6
Cleburne	.....	.....	.....	.....	.....	.....	.....	.....	8,000
Dallas	.....	.....	.....	106,885	.....	41,446	.....	.....	.....
Waxahachie	.....	.....	.....	3.63	.....	.....	.....	.....	.....
Weatherford	.....	.....	.....	.....	.....	.....	.....	45,000	.....
Utah									
Ogden	.....	.....	.....	114,080	.....	.....	.....	.....	.....
Salt Lake City	62,263.4	81,273.2	.....	.....	.....	.....	.....	.....	.....
Vermont									
Springfield	.....	.....	2,728	.....	.....	.....	.....	.....	600
Virginia									
Clifton Forge	.....	.....	.....	.....	.....	.....	.....	2,000	2,000
Norfolk	70,718	.....	.....	.....	.....	.....	.....	.....	.....
Richmond	.....	.....	.....	.....	.....	.....	.....	8,000*	.....
Washington									
Olympia	1,370	.....	.....	.....	.....	.....	.....	.....	.....
Seattle	7,786	19,844	.....	.....	.....	.....	.....	.....	.....
Spokane	.....	.....	12,588	.....	.....	.....	.....	.....	.....
Walla Walla	.....	.....	.....	18,700	.....	.....	.....	.....	.....
West Virginia									
Parkersburg	22,342	.....	.....	.....	.....	.....	.....	.....	.....
Wisconsin									
Beloit	30,000	.....	.....	.....	.....	.....	.....	.....	.....
Eau Claire	.....	800	.....	.....	.....	.....	.....	.....	6
Madison	3.03	.....	.....	.....	.....	.....	.....	.....	.....
Racine	7,698.90	.....	.....	.....	.....	.....	.....	.....	2,843
Waukesha	2 500	.....	.....	.....	.....	.....	.....	.....	.....

*Information furnished by dealers. †7,000 Topeka on stone base, 3,000 on concrete base. b—lineal feet.

Recent Legal Decisions

WATER POLLUTION—PETITION FOR INJUNCTION AGAINST MUNICIPALITY DISMISSED

In a suit by a riparian owner against a municipality to enjoin pollution of a stream, the petition alleged that the city had constructed and put into operation a sewerage system for the disposal of specified foul matters; that the sewage of the city drained into certain septic tanks, from which there were drains emptying into a branch that further down passed through the plaintiff's land, and near her residence; that the waters of the branch became contaminated and emitted foul and poisonous odors and gases that were disagreeable and injurious to health, and rendered the plaintiff's residence uninhabitable; "that said sewerage system was not properly constructed, and if it had been . . . it would not contaminate said stream; . . . said sewage is first emptied into a septic tank and thence into said stream; . . . said sewage comes out of said tank into said stream in a highly impure state. . . . Petitioner does not know how said tank is constructed . . . but if same was constructed for the purpose of purifying the discharge into it, the same fails of its purpose." The Georgia Supreme Court holds, Langbridge v. City of Dalton, 104 S. E. 427, that construing the petition most strongly against the pleader, it shows upon its face that the cause of complaint was alleged improper construction of the sewerage system; and no specific defect in the system being alleged, there was no error in sustaining a demurrer thereto and dismissing the petition.

INJUNCTION FOR OBSTRUCTION OF HIGHWAY BY FENCE

The Iowa Supreme Court holds, Phillips v. Crawford, 179 N. W. 937, that township trustees, having the duty of protecting the traveling public against the dangers of actual obstruction of the township highway, may bring a suit to enjoin an obstruction by an abutting owner who has erected a fence thereon.

CONDEMNATION BY MUNICIPALITY OF LAND IN ANOTHER STATE FOR WATER WORKS

Injunction was sought to prevent the city of Walla Walla, Washington, from making certain betterments and extensions to its existing water works system and issuing bonds therefor. The water supply is obtained from Mill creek, which has its source in Washington, flows across the state line into Oregon and through that state for about four miles, then back into Washington. One of the city's problems was that it would be necessary to acquire additional property rights upon and adjacent to Mill creek in Oregon, by the exercise of the eminent domain of that state, and if the city had not the power to do so the improvements could not be made. The Washington Supreme Court holds, Langdon v. City of Walla Walla, 193 Pac. 1, that in view of Washington Rem. Code, 1915, Sections 7612 and 8005, providing for the acquisition of water works within or without the corporate limits of the city, the power of acquiring and owning such property is not limited to property within the state of Washington, the property being held in the city's proprietary, and not in its governmental capacity; and to allow the acquisition is not an assumption of extraterritorial jurisdiction. The state of Oregon might, of course, withhold from the cities of Washington the right to acquire property in Oregon, just as it may withhold such right from any other foreign corporation. But the Oregon legislature in 1909 passed a law providing that any municipal corporation of any adjacent state might acquire any land or water right in the state, by purchase or condemnation for the purpose of water supply. The acquisition of land for water works purposes in Oregon is held to be a public use which will support the exercise of the right of eminent domain under the Oregon statute, in view of the reciprocal laws of the two states upon the matter, notwithstanding the provision of the Oregon Constitution making public use a judicial rather than a legislative question.

AWNINGS AS ENCROACHMENTS ON SIDEWALKS

The Georgia Supreme Court holds, Bailey v. City of Elberton, 104 S. E. 639, on the authority of prior Georgia decision, that an awning of any kind extending over the sidewalks of a city is an encroachment and is to some extent an obstruction, and one which the city has the power to remove; and that a resolution by the mayor and council of the city providing for the removal of wooden and sheet metal awnings in the business section of the city is prima facie valid. While the governing authorities of the municipality may not needlessly, capriciously, and arbitrarily require the removal of awnings from its streets, whether erected under an express or implied license, the burden is upon a plaintiff seeking injunction of such a resolution to show a needless, capricious or arbitrary exercise of power by the governmental authorities of the municipality.

EXCESS WORK DISTINGUISHED FROM EXTRA WORK IN ROAD CONTRACT

The Circuit Court of Appeals, Fifth Circuit, holds, Holmes County, Miss., v. Burton Construction Co., 267 Fed. 769, that the direction of a verdict for a contractor with a county for road work, for excess work done as extra work, was error, where the contract expressly provided that excess work of the same kind as that specified should not be considered extra work, but be paid for at contract price, while extra work was to be paid for on a different basis. The fact that the engineer in charge of the work may have construed the work as extra work would not be binding on the county. The engineer is not authorized to determine the legal effect of plain and unambiguous terms in such a contract. His authority extends only to the application of his engineering judgment to matters of fact in controversy.

NEWS OF THE SOCIETIES

Feb. 21-23 — MINNESOTA SURVEYORS' AND ENGINEERS' SOCIETY. Annual convention. Hotel Commodore, St. Paul.

Feb. 23—MID-WESTERN CONFERENCE ON HIGHWAY AND HIGHWAY TRANSPORT EDUCATION. Ann Arbor, Mich.

Feb. 25—NEW YORK SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Engineering Societies Building, New York City.

Feb. 25-26—CONSTRUCTION DIVISION, U. S. ARMY. Annual reunion of those identified with this division during the war. Morrison Hotel, Chicago, Ill.

Feb. 28 — PHILADELPHIA SEC-MECHANICAL ENGINEERS. Engineers' Club of Philadelphia.

Feb. 28 — CHICAGO SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

March 11—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Engineering Societies Building, New York City.

March 11-12 — NORTHWESTERN ASSOCIATION OF GENERAL CONTRACTORS. St. Paul Hotel, St. Paul, Minn.

March 14—AMERICAN ASSOCIATION OF ENGINEERS. The third annual railroad conference. Chicago.

March 18—SCHENECTADY SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

April 16—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Joint meeting with the Association of Iron and Steel Electrical Engineers. Pittsburgh, Pa.

April 18-23 — UNITED STATES GOOD ROADS ASSOCIATION. Greensboro, N. C.

April 27—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual convention. Houston, Texas.

April 27-29—UNITED STATES CHAMBER OF COMMERCE. 9th annual meeting. Atlantic City, N. J.

May 9-11—AMERICAN ASSOCIATION OF ENGINEERS. 7th annual convention. Buffalo.

May 9-12 — SOUTH-WEST WATER WORKS ASSOCIATION. Oklahoma City. Headquarters Skirvin Hotel.

May 17-19—NATIONAL FIREMEN'S ASSOCIATION. Twenty-third annual convention. Fort Wayne, Ind.

June—CONFERENCE OF MAYORS AND OTHER CITY OFFICIALS, State of N. Y. 12th Annual Conference. Elmira, N. Y.

June 6-10—AMERICAN WATER TER WORKS ASSOCIATION. Annual convention at Cleveland, Ohio. Secretary, J. M. Diven, 153 West 71st St., New York.

June 7-9—NATIONAL FIRE PROTECTION ASSOCIATION. Annual meeting. San Francisco, Cal.

Oct., 1921—IOWA SECTION, AMERICAN WATER WORKS ASSOCIATION. Seventh annual meeting.

BROOKLYN ENGINEERS' CLUB

At the regular meeting of the Brooklyn Engineers' Club, February 10, a paper entitled: "Aeronautical Model Testing," was presented by S. S. Rathburn, formerly a member of the Aeronautic Staff Construction Department of the Washington Navy Yard. The author compared aeronautic, hydraulic and marine problems, discussed wind tunnels and other equipment for model testing and compared the performances of full-sized machines with tests on small models, and applied data obtained to other commercial lines.

At the February 17 meeting, "The Making of White Lead" was illustrated by moving picture films showing the process from the ore to the finished paint, presented by R. L. Hallet, assistant chemist of the National Lead Company.

On February 24 there will be a discussion of the Transit Situation in Brooklyn.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

The second annual conference of the Associated General Contractors of America took place in New Orleans, La., on January 25-27. There were present about 250 contractors from 28 states. The meeting was presided over by President Rogers. The necessity of looking not merely to the year ahead but to look years ahead was emphasized.

The first problem before the meeting was that of quantity survey and payment for estimating. A. P. Greensfelder reported that the co-operation of the American Institute of Architects had been secured, but it was maintained that not all the Association of Architects were backing up this movement, and it was recommended that a system of money accounting by contractors be formulated.

The next important problem was that of contracts. Most contracts, it was claimed, are unfair to the contractor, and the two principal forms of contracts to be considered were discussed. These were the cost-plus-fixed-sum contract, a draft of which has been prepared, and the unit-price contract, on which work is now under way.

The question of labor was also considered. High prices were, of course, opposed, but it was decided not to go on record as taking this stand. Open shop was favored and the attempt to yoke union and non-union labor was discussed. A Department of Public Works for the national government was also heartily encouraged. All this was of great interest in view of the need for millions of houses throughout the United States.

Officers for the ensuing year were elected as follows: President, W. O. Winston; vice-presidents, F. L. Cranford, Arthur Bent, Daniel Breck, W. E. Wood; treasurer, Lee Paschall; directors, N. F. Hoggson, W. A. Starrett, G. O. Muhlfeld, J. R. Wiggins, G. C. Mason, Richard McCarthy, A. E. Wells and Charles Ffolliott; and members of the advisory board, R. B. Porter, T R Flagler, Thomas Bentley, A. P. Greensfelder, Edward Haupt and E. F. Mullen.

CAPE BRETON BRANCH, E. I. C.

Engineers in Cape Breton have formed a branch of the Engineering Institute of Canada, making twenty branches of the institute. Meetings will be held once a month and headquarters will be in Sydney, N. S. The following officers have been elected: Chairman, C. M. Odell; secretary-treasurer, K. G. Cameron; executives, T. J. Brown, H. F. Lawrence and D. S. Morrison.

CONNECTICUT SOCIETY OF CIVIL ENGINEERS

The thirty-seventh annual meeting of the Connecticut Society of Civil Engineers was held at New Haven, February 15 and 16. The business meeting was called to order at 10 a. m., February 15, and consisted of reports, elections and new business. The new business consisted of the continuation of the discussion of the proposed "National Department of Public Works," presented by Mr. Leonard Metcalf, on October 31, 1919; and also of the discussion of "The Super-power Line," presented by Mr. W. S. Murray, on December 2, 1919. There were proposed for discussion the licensing, registration or certification of civil engineers, both as a state and federal matter. A bill is now before the state legislature, introduced by Representative Frederick L. Ford. This bill was read and discussed.

The afternoon session was devoted to transportation, the scheduled speakers being A. G. Gutheim on "The Railroad Transportation of the United States"; R. L. Dean on "Shipping, etc."; H. McL. Harding on "Docks, Quays and Piers," and Charles J. Bennett on "Highway Transportation."

Tuesday evening, after the dinner, Mr. R. S. McElwee spoke on "Port Facilities."

The Wednesday morning session was held at the Mason Laboratory, and the topics discussed included the construction and operation of the swimming pool in one of the Hartford parks by Alesander S. Lynch; "Business Conditions," by Eugene Meyer, Jr.; "The Alaska Railroad," by a representative of the Department of Interior, and moving pictures shown by the Portland Cement Association and the American Air Service Corporation.

BROOKLYN ENGINEERS' CLUB

An informal library talk was held on Thursday, February 3, 1921, on the "Canalization of the St. Lawrence River and the Development of Water Power of St. Lawrence and Niagara Rivers." The talk was given by T. Kennard Thomson, consulting engineer, New York City, and was accompanied by lantern slides.

WEBSTER CITY ENGINEERS' CLUB

The Webster City Engineers' Club, one of the sectional clubs of the Iowa Engineering Society, held its first regular meeting January 29. After the regular program the members entered into an informal discussion of the future activities of the club. The club at present has fifteen members and expects to double its membership in the near future.

HIGHWAY CONTRACTORS OF MASSACHUSETTS

A meeting was held January 13 at the Boston City Club, of all the contractors doing highway work. The purpose of the meeting was the formation of a permanent organization of highway contractors to replace the temporary one already formed.

ARKANSAS ENGINEERING SOCIETY

At the annual meeting of the Arkansas Engineering Society held in Little Rock on January 17, it was voted to apply for a charter as a chapter of the American Association of Engineers.

THE NATIONAL CONGRESS OF BUILDING AND CONSTRUCTION INDUSTRY

In accordance with the decision last September, in Chicago, of the executive board of the Congress, local conferences have been organized in Omaha and in Boston. In New oYrk a small group has begun a series of weekly meetings to discuss conditions in the New York district and the need of a local industry conference. A conference organizing committee of eighteen called a conferenec of representatives from all branches of the industry, held on January 25. This conference resolved that an organizing committee be appointed consisting of two architects, two contractors, two sub-contractors, two labor representatives, two manufacturers, two dealers, two financiers, two investing builders, two representatives of the trade press, and two engineers together with such others as will make the committee representative of every interest and element in the industry in New York City to prepare a program providing for the creation of a permanent conference of the building and construction industry in the New York district.

The organizing committee provided for in the resolution quoted is to be appointed by a nominating committee of six which consists of the following men: Electus D. Litchfield, architect; F. M. Feiker, managing editor McGraw-Hill publications; Ronald Taylor, sub-contractor; John Lowry, Jr., general contractor; Andrew J. Post, steel contractor; and Alexander M. Bing, investing builder.

The executive board urges the importance of calling similar conferences to those already held in Omaha, Boston and New York in the following cities: Chicago, St. Louis, Pittsburgh, Philadelphia, Cleveland, New Orleans. Copies of programs of the local conferences already held and information in regard to the methods adopted in calling them will be furnished on application to the secretary of the National Congress of the Building and Construction Industry, 19 West 44th street,

TEXAS ROAD BUILDERS' ASSOCIATION

At the second annual meeting of the Texas Road Builders' Association held in Austin, January 19 and 20, there was an attendance of 127, the objects of the association were enthusiastically promoted and it was determined to endeavor to provide a paid secretary for the organization.

Among the topics discussed was the labor question involving the employment of convicts on road work which was endorsed by Judge L. G. Mathews and by A. F. Mitchell, the county engineer of Milam county, and opposed by B. D. Panas, of the Granite Gravel & Sand Company.

Major Clark Mandago, chief engineer of the Western Brick Manufacturers' Association, Kansas City, presented a paper on "Types of Brick Pavements." Motion pictures were shown illustrating the Holt caterpillar tractors and portable cranes in action.

Capt. J. D. Fauntleroy, engineer in charge of District 6, Bureau of Public Roads, comprising Texas, Arkansas, Louisiana and Oklahoma, presented slides showing road construction, details of pavement and roads that had failed, together with the reason of failure. He stated that Texas has completed 400 miles of Federal Aid highways and has 1,600 miles under construction, thus exceeding any other state, besides which there are 500 miles of State Aid roads completed without Federal Aid. The recent shortage of Portland cement was explained by H. C. Koch, sales manager of the Portland Cement Company.

The following officers were elected: President, L. G. Mathews, Coleman, county judge of Coleman county; vice-presidents, Julian Montgomery, city engineer of Wichita Falls; W. O. Washington, Brownsville, engineer for Cameron county; D. E. H. Manigault, engineer, Division No. 5, El Paso; W. J Kelly, Trinity, engineer for Trinity county; directors, Fred Rightor, Austin, president Southwest Bitulithic Co.; Hugh L. Small, Fort Worth, county judge of Tarrant county; E. L. Dennis, Jr., sales manager, Texas Trap Rock Co., San Antonio; J. C. Nagle, College Station, Dean A. & M. College.

ASSOCIATION OF GENERAL CONTRACTORS

At the New Orleans convention last month, the Association of General Contractors officially endorsed by formal resolutions a number of subjects important to construction interests, including:

A request to the Federal Reserve Board to allocate sufficient funds to aid construction.

Approval of an open market for all construction materials and opposition to all price fixing combinations; and opposition to any combination of unions or contractors limiting employment to any particular class.

Request that the Secretary of Commerce secure information relative to construction materials.

Approval of a national budget.

Request to Congress that legislation authorizing partial payments of the railroad claims be passed.

Approval of a National Department of Public Works.

Support of the Lockwood Legislative Committee investigation in New York and recommendation that the governors of every state be urged to consider a similar investigation.

Recommendation that contractors do not make agreements fixing for a long period the prices either of labor or material, and instructions to the executive board to investigate what constitutes a fair and just wage in construction trades.

Recommendation that inquiry be made as to the economy of doing public work by day labor.

The tentative program for the principal activities of the association during 1921 includes:

Standardization of building codes.

Industrial relations (of which thirteen specific subjects are enumerated in the report of the committee on labor).

Formulation of specific procedure for use in time of national emergency affecting general contractors.

Research of the proper principles on which action, legislative or other, should be based on materials, labor, transportation, industrial relations.

Report on quantity survey and payment for estimating.

Formation of a system of money accounting for contractors.

Compensation insurance classification and rates.

Preparation and revision of contract forms for use between contractor and (a) owner, (b) sub-contractor, (c) material man, and (d) equipment man.

Promotion of Department of Public Works.

Calder committee on reconstruction and production.

Lockwood legislative committee.

Immigration restriction.

ENGINEERS' CLUB OF BALTIMORE

The Engineers' Club of Baltimore has reorganized and includes the local branches of the chemical, civil, electrical and mechanical engineers. The following officers were elected: President, Ezra B. Whitmann; first vice-president, Dr. Frank M. Boyles; second vice-president, Edward B. Passano,; and treasurer, W. V. Varney.

PERSONALS

George, Howard H., of the Public Service Railroad Co., of Newark, N. J., has been promoted from assistant engineer to engineer.

Dods, Andrew, general manager of the Ontario Sewer Pipe Co., of Mimico, Ont., has been elected utilities commissioner of that municipality.

Stevenson, W. V., has been re-appointed secretary-treasurer of the Rural Municipality of Woodworth, Man., which position he has held for 24 years.

Washington, Walter, has been appointed city manager of Charlottesville, Va., to succeed Shelton S. Fife.

Lynch, Maurice A., has resigned as district engineer at Smethport, Pa., Pennsylvania State Highway Department.

Adams, Francis, has been appointed city engineer of Brantford, Ont.

Fitch, Squire E., has been appointed division engineer, New York State Commission of Highways, with headquarters at Buffalo, N. Y.

Schuck, Adolph P., has been appointed commissioner of street cleaning of Baltimore, Md., to succeed William A. McCleary.

Andros, Charles, formerly senior assistant engineer of the New York State Highway Department, has accepted a position in the U. S. Patent Office at Washington, D. C.

Treadway, J. S., of Fort Worth, Texas, has been appointed county engineer of Bell county.

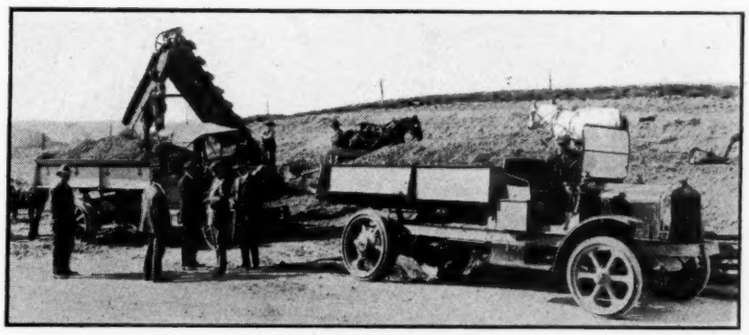
Egan, Patrick J., clerk of the water commission of New Britain, Conn., died at his home in that city on January 15.

O'Shaughnessy, Jeremiah, superintendent of the division of water, Columbus, Ohio, died on January 28.

Schreiber, Joseph, former chief engineer of the St. Louis water works, died on January 7, at the age of 63.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations



MOTOR TRUCKS AND LOADING MACHINES ON ROAD WORK IN CALIFORNIA

Two 5-ton White motor trucks employed on highway work in San Luis Obispo county, Cal., have each daily made six round trips, averaging 13 miles in length, carrying between 5½ and 6 yards of gravel. Four horses, pulling a wagon and two yards of gravel, made two round trips a day, two teams thus transporting four yards to every 35 hauled and spread by a single motor truck.

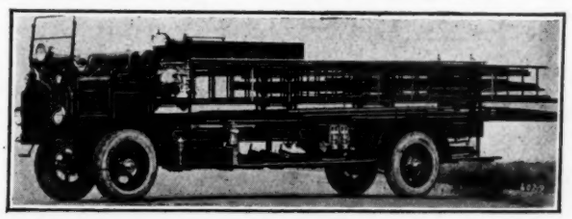
When not engaged in hauling gravel or spreading it along the road, the sturdy trucks are used in pulling road machinery or, equipped with 1,500-gallon tanks, in sprinkling the road.

The present method of excavating, loading, transporting and spreading gravel by motor truck is estimated to cost two-thirds less than in the days when horses were the sole equipment. Now, workmen plow up the tenacious gravel and scrape it within reach of the mechanical loader installed at the side of the gravel bank. A truck can be loaded and started on its way in ten minutes. Arrived at its destination, the truck distributes its load by means of the spreader, which is part of its mechanism.

During five months of 1920, eight miles of gravel were laid in San Luis Obispo county.

NEW FIRE DEPARTMENT TRUCK

A new 216-inch wheel base hook and ladder fire truck, with a forty-gallon chemical tank, has been put into service by the city of Ashland, Wis. This fire-fighting equipment is mounted on a 3-ton four-wheel drive chassis. Power is furnished by an unusually powerful type J Wisconsin motor of 5.1-inch bore and 5½-inch stroke. The truck is run at an average speed of 25 miles per hour and has an excess power available for maintaining this speed under poor road and grade conditions.



HOOK AND LADDER TRUCK WITH CHEMICAL TANK

TRAFFIC TRUCKS AND BODIES

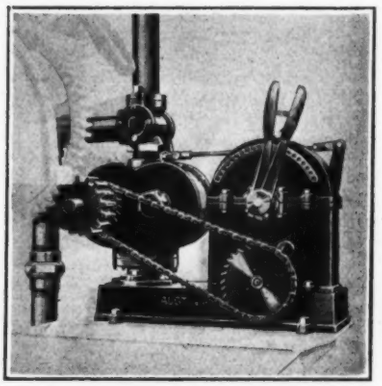
The trucks and bodies manufactured by the Traffic Motor Truck Corporation have been thoroughly standardized for quantity production and the plant and organization efforts have been concentrated on a single truck model.

The truck, with a maximum carrying capacity of 4,000 pounds, has a 133-inch wheel base, is 212½ inches long over all and has a turning radius of 26 feet and a road clearance of 12 inches. The chassis weight is 3,300 pounds and it is equipped with a four-cylinder Red Seal Continental motor, gear-driven oil pump, automatic carburetor, 12-gallon gasoline tank, an oversized radiator, multiple-disc clutch, solid tires, has three speeds forward and one reverse.

The chassis has a 132-inch wheel base, a frame 121 inches long behind driver's seat, and can be supplied with an open seat or with an enclosed driver's cab and can be furnished either with a standard platform and a standard express body, 52½ inches wide by 125½ inches long, a standard 60 x 126 x 24-inch grain body, a standard 61¾ x 127¾ x 42-inch stake body, a standard 57⅛ x 126 x 48-inch hog or cattle body, a standard 56 x 100 x 25-inch all-steel dump body with hoists, or it can be furnished with a standard all-steel 500-gallon oil tank, 127 inches long, having a 42 x 36-inch elliptical cross section, and divided into 100-gallon and 200-gallon and oil can compartments.

AUSTIN METER PUMP

A small, simple pump that can be geared to the shaft of a concrete mixer, can lift water 12 feet, measure and record it and deliver it to the mixing drum, has been put on the market by the Austin Machinery Corporation to govern the amount of water used in mixing concrete. Any required quantity per batch can be secured merely by setting a pin in the device, before the operator opens the two-way valve



SPROCKET DRIVEN METER PUMP

by throwing the starting lever, after which the valve automatically closes as soon as the pump has delivered the predetermined quantity of water to the mixer and requires no farther attention till the lever is again operated for the next batch, and so on. The pump and attachments weigh about 200 pounds and have a range of 250 per cent between minimum and maximum discharge.

THE FORT PITT SECTIONAL BUNK

The sectional bunks made by the Fort Pitt Bedding Company in stock sizes 2 ft. 6 in. x 6 ft. 5 in. and 3 ft. x 6 ft. 5 in., have simple angle-iron riveted frames and steel spring mattresses, and are finished with black japan. They are made in units with a very simple interlock that enables them to be stacked, like bookcases, in sets of two, three or four, without adjustment or possibility of accidental disengagement. They are light, strong, sanitary, comfortable and durable and can be folded flat for shipment.

SANTEST

The Abrams-Harder field test for organic impurities in sand tells whether sand is free from organic impurities and suitable for use in concrete and is useful or prospecting for sand supplies, checking the cleanness of sand received on the job, and for preliminary examination of sands in the laboratory. It eliminates need of scales or weighing chemicals, keeping or transporting of caustic chemical solutions, and the test can be made easily in little time by a non-technical person. The official color chart is furnished so that comparisons can be easily made. Sufficient glassware is supplied to allow the making of six tests simultaneously, and tubes of chemicals sufficient for 24 tests are furnished. The apparatus is neatly boxed for carrying into the field. Sold by the Standard Concrete Apparatus Co.

INDUSTRIAL NOTES

Early in January the Houston Construction Company, Houston, Texas, started work on a 15½ mile contract on State Highway No. 3, Orange and Beaumont road.

Remarkable results are being attained on this work with a 21-E Smith paver, Lee body trucks, a Byers crane connected to a stiff-leg derrick, with a clam-shell bucket, Blaw-Knox road forms and a Lakewood finishing machine.

Fifteen trucks loaded from storage bins filled from railroad cars by a clam-shell bucket are used to keep the paving mixer supplied with the aggregates. The trucks are run onto a turntable just ahead of the paver, where they are turned and then backed up to the paver skip. They then dump their loads directly into the closed end skip.

The working schedule has all been well arranged so that there are only 43 men on the entire job, including those at the material yards, on the trucks and at the paving mixer and finishing machine.

It is a 16-foot road, average thickness 6¼ inches.

The Atlas Powder Company produced a non-freezing explosive that is manufactured in five grades for every blasting requirement; cannot freeze at any temperature; withstands the heat of summer; its stability avoids premature explosions (nothing weaker than a No. 6 blasting cap should be used to detonate it); will not cause headaches to those who use and handle it; is made in all standard size cartridges.

The control of the Chicago Incinerator Company has been acquired by Joseph oder who previously controlled the patent of the B-EE and the Goder furnaces and will move the offices and plant of the company from Turner avenue to East North Water street, Chicago.

REINFORCED vs. PLAIN CONCRETE HIGHWAYS

Under this title H. Eltinge Breed, consulting engineer of New York City, and formerly deputy state highway commissioner for New York State, has written an interesting and valuable monograph published by the National Steel Fabric Company, First National Bank building, Pittsburgh, which will mail it on application.

Starting with the importance and rapid growth of concrete highways, which in the last nine years has increased from an annual construction of less than 1,000,000 square yards to 52,000,000 square yards in 1919, Mr. Breed notes that appreciation of reinforcement in concrete pavement that has been manifested by numerous suggestions for its use in an ideal section of the Lincoln Highway. He discusses the destructive cracks in concrete highways, their cause and effect, and the textile and compressive stresses, impact and fatigue of the materials that tend to produce them. He gives his own practice and rules for reinforcing concrete pavement, and computes the economy of cost effected by the use of reinforcement.

He describes a number of pavements which have been reinforced with excellent results and concludes that the use of reinforcement steel in concrete pavements preserves the integrity of the pavement and prolongs its life, and recommends the use of a reinforcement that has a ratio of 1 longitudinally to 3½ to 5 transversely, except in city work where the ratios should be decreased to 1 longitudinally to 1 to 2½ transversely.

The San Francisco Fire Department held a test of smoke masks on January 7. The materials used in the test were sulphur, red pepper, straw, excelsior and wood. Five masks were used in the test, three of the self-contained oxygen type, and two filter masks. One of the filter masks tested was a La France. One filter mask was a complete failure as the operator could only remain in the smoke-filled room for three minutes. The La France mask successfully passed through four tests. A representative of the company, wearing a La France mask, was able to endure the fumes of the burning material during three consecutive tests of 10, 13½ and 15 minutes each. A fireman of the San Francisco department then put on a La France mask and remained in the smoke for 22 minutes before feeling any effects. The self-contained oxygen masks all passed the tests satisfactorily, as was to be expected with their independent air supply, but they did not demonstrate any marked points of superiority over the more comfortable and less expensive filter mask.

The report of the Southern Pine Association for the week ending February 4 shows that the actual production of 135 mills, nine of which were completely shut down and 30 shut down from 1 to 5 days, was 429.082 thousand feet, which is 35.48 per cent below normal.

R. B. Murdock has resigned as executive engineer of the Asphalt Association and is now concerned with the eastern domestic and export sales of the F. D. Cummer & Son Co., of Cleveland and New York, manufacturers of asphalt paving plants and driers. His offices are at 19 W. 44th street, New York City.

PERSONALS

Blodgett, L. B., has resigned as assistant county engineer of Gogebic county, Mich., to accept a similar position with Houghton county, Mich.

Hall, A. W. D., has resigned as city manager of Jackson, Mich., to become manager of Tampa, Fla., and is succeeded by Edward C. Meyfarth, assistant city manager.

Little, A. S. B., first assistant engineer of the Public Utilities Commission of Illinois, has resigned.

Lawlor, Thomas F., former president of the Board of Public Works, Poughkeepsie, N. Y., has been appointed superintendent of public works.

Henderson, William S., has been appointed city engineer of Lawrence, Kan., and, when the resignation of L. A. Quigley becomes effective, is to be superintendent of the water plant.

Kelly, W. J., formerly highway engineer, Walker county, Texas, is to be in charge of all road building in Trinity county.

Lyon, Major L. E., Corps of Engineers, U. S. Army, is to be engineer of the Philadelphia district.

DuFresne, L. A., has been appointed highway engineer of Calhoun county, Miss.

Russell, G. A., formerly engineer of Geary county, Kan., has been appointed engineer of Pottawatomie county, Kan.

Wilson, F. S., has been appointed member of the city planning commission of Kansas City, Kan.

Reynolds, Elbert, highway engineer of Jefferson county, Ark., has been appointed engineer for the State Highway Commission. He will continue to direct the highway work of Jefferson county.

Donohue, Jerry, of Sheboygan, Wis., has been appointed city engineer of Hartford, Wis.

Gungel, E. W., has been appointed chief inspector of the smoke inspection bureau of Harrisburg, Pa., which has recently been established.

Koch, H. F., has resigned as city engineer of Denton, Texas.

Irvin, William M., has been appointed county engineer of Jefferson county, Kansas.

Tokelson, F. A., has resigned as county road engineer of Chippewa county, Michigan.

Brusewitz, A. G., has resigned as county highway commissioner of Outagamie county, Wisconsin.

Stahl, C. E., formerly highway engineer of Renville county, Minnesota, has been appointed locating engineer of the Minnesota State Highway Department.

Cappelen, F. W., Minneapolis city engineer, has been appointed by Herbert Hoover as a member of the classification and compensation committee of the American Engineers' Council.

Cutler, Manuel C., has been appointed superintendent of the Bridge and Public Buildings Department of the Department of Public Works, Milwaukee, Wis.

Boaker, J. O., is to become city manager of Tufkin, Texas.

Rosenthal, David, in charge of the Dealers' Service Department of the Southern Pine Association for the past two years, has left to accept a position with the Lane Cotton Mill Company, of New Orleans.

Cadle, C. L., formerly chief engineer of the New York State Railways Association, has been appointed superintendent of Public Works for New York State.